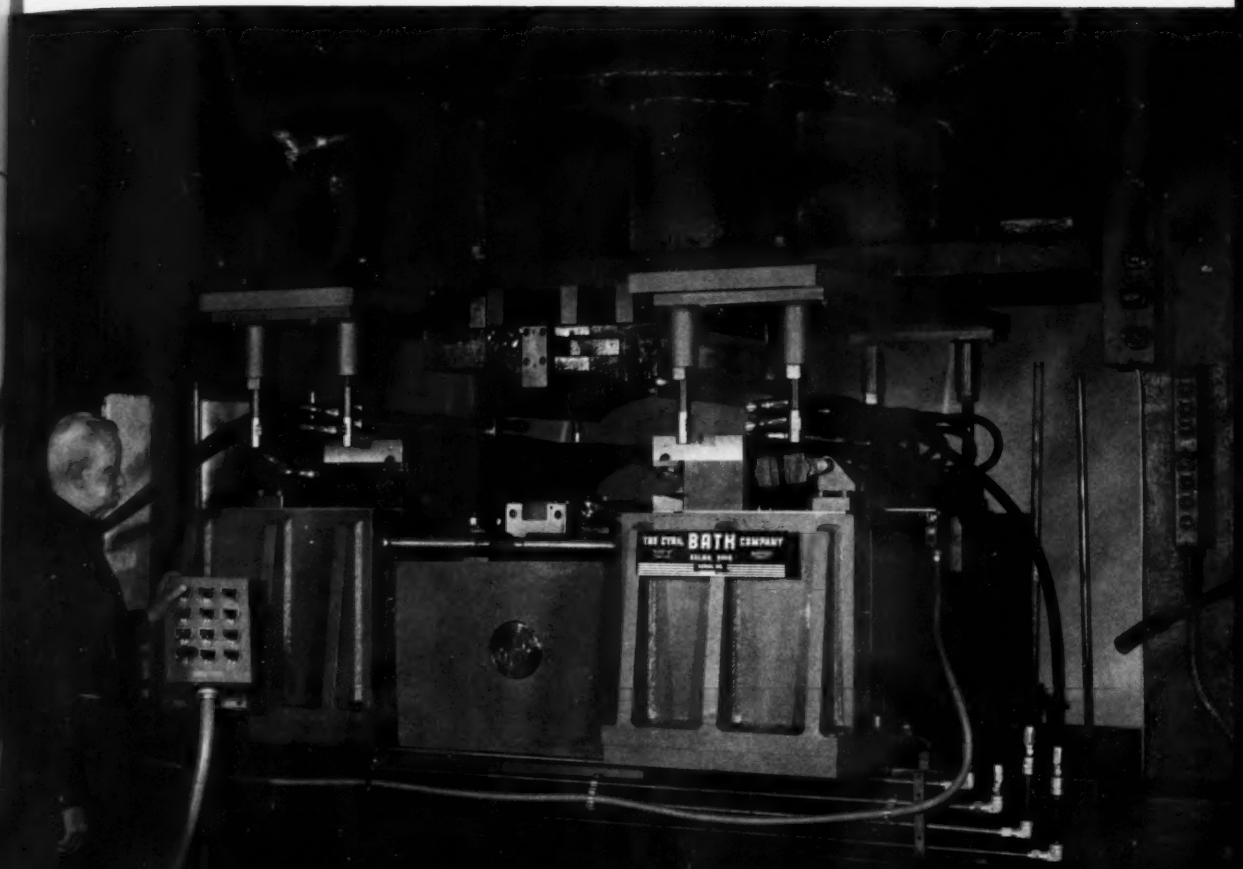
TOOLING & PRODUCTION

DECEMBER 1960

The Magazine of Metal Working Methods



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Breakthrough In Electrochemical Machining . . . page 47

Complete Table of Contents . . . Inside Cover

NEW
WARNER & SWASEY

NO. 2 MICRO-CUT
UNIVERSAL TURRET LATHE

The first 1¼" capacity turret lathe with full universal, power feed cross slide plus greater accuracy and heavier metal removal capabilities.

The new No. 2 MICRO-CUT Universal is a new kind of turret lathe, especially designed to handle close tolerance work up to 1¼-inch diameter—in all types of materials—in small to medium lot sizes. It is quick to set up, easy to operate, and is available for either bar or chucking work with plain or universal cross slide. The No. 2 MICRO-CUT is ideally suited to handle a wide variety of small diameter turning work in those fields where extreme accuracy, even with heavy metal removal, is essential to profitable operations.

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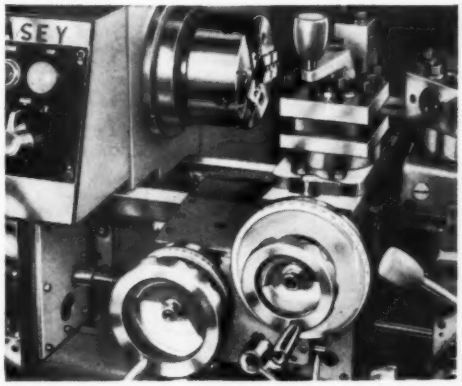
Hexagon	1 1/16"
CHUCK DIAMETER	6"
POWER FEEDS	
Six longitudinal	.0015 to .0173
Six cross	.0014 to .016
SPINDLE SPEEDS	
Three ranges of six	50 to 3000 rpm
MOTOR — Two Speed	5/2½ hp



UNIVERSAL CROSS SLIDE & THREE JAW CHUCK
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CIRCLE INFORM-A-GRAM KEY NO. 2

TOOLING & PRODUCTION Magazine

VOL. XXVI, No. 9

DECEMBER 1960

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BPA

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R. L. Huebner, Publisher

E. Willard Pennington, Editor

William E. Hoffman, Managing Editor

Charles Weiner, Assistant Editor

Lawrence J. Curran, News Editor

Margel F. Benn, Editorial Assistant

Contributing Editors:

Carl F. Benner

Ernest J. Urbas

Nyles V. Reinfeld

E. J. Brooks, Art Director

B. C. Jackson, Research Manager

P. E. Hager, Production Manager

Douglas Banister, Circulation Manager

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CIRCLE INFORM-A-GRAM KEY NO. 4

DECEMBER 1960
VOL. XXVI, No. 9
GEORGE J. HUEBNER, Founder
1885 - 1956

personally speaking...

Dear T & P Reader:

Now that the election is off our minds, all we have to worry about is keeping industry humming, — in spite of or with the help of government, — you name it. Like someone remarked facetiously, "It came out just like I expected. One of them was bound to win." I hope your man won.

The way it looks to me, the winner can become the greatest president we've ever had. In fact, he almost has to be that because of what has to be accomplished. As a nation we have to grow economically every year just to stand still. I've heard a figure of 3% minimum growth average per year being needed. Growth has to be substantial when you consider that our cost of all government in the U. S. is 100 billions of dollars a year or about one fifth of our present G.N.P. and government isn't getting any cheaper, especially at local levels.

I heard an intriguing remark made by the speaker at a meeting I attended a couple of weeks ago. He said that one third of all the people who have been born since the beginning of human life on earth are living today. No wonder human life is so cheap in some parts of the world. If we, in the U. S. continue to increase as rapidly as is indicated in an article in the November Reader's Digest, we can look forward to a sure cure for our farm surpluses. All we need now in order to solve the problem is enough more mouths to feed and enough less acreage under cultivation and we're rushing toward this goal at a tremendous rate.

All of this brings me to the point of this piece. We're moving rapidly to the time when the war babies are of marriageable age. Very soon we'll again be creating families at a great rate and there will be needed increased quantities of manufactured goods of all kinds. You might as well get used to anticipating these increases and plan now to cope with them. The companies that do the best coping will probably derive the most benefits for employees and owners.

Coping with what is coming is a matter of tooling to do the job you have to do. One way of tooling up for the future may be through employing numerical control, — so don't miss our comprehensive article on the subject coming in our January 1961 issue.

Season's Greetings and the best ever to you in 1961.

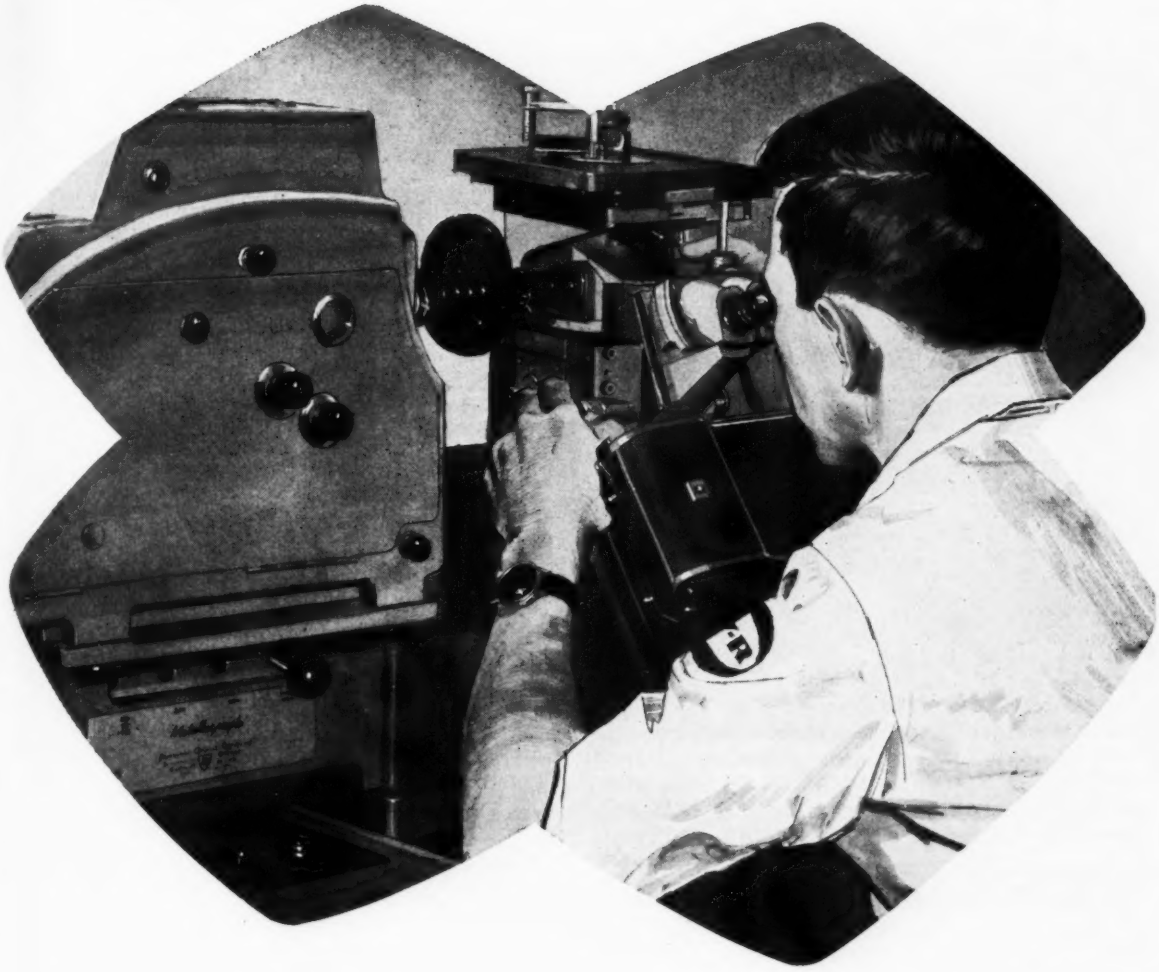
Cordially yours,

Ray Huebner

Publisher

V-R

CREATING THE METALS THAT SHAPE THE FUTURE



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It's no wonder that V-R carbides give consistent performance under any circumstance. Carbide consistency is largely due to the varied and frequent quality checks at every step in production processing. Here, we see a metallograph being used to check grain structure and absence of porosity against rigid standards. Similar checks are made constantly to assure proper hardness, density, and transverse rupture strength. Each and every piece of any V-R grade always will perform the same. Yes, quality control here at V-R is important to you.

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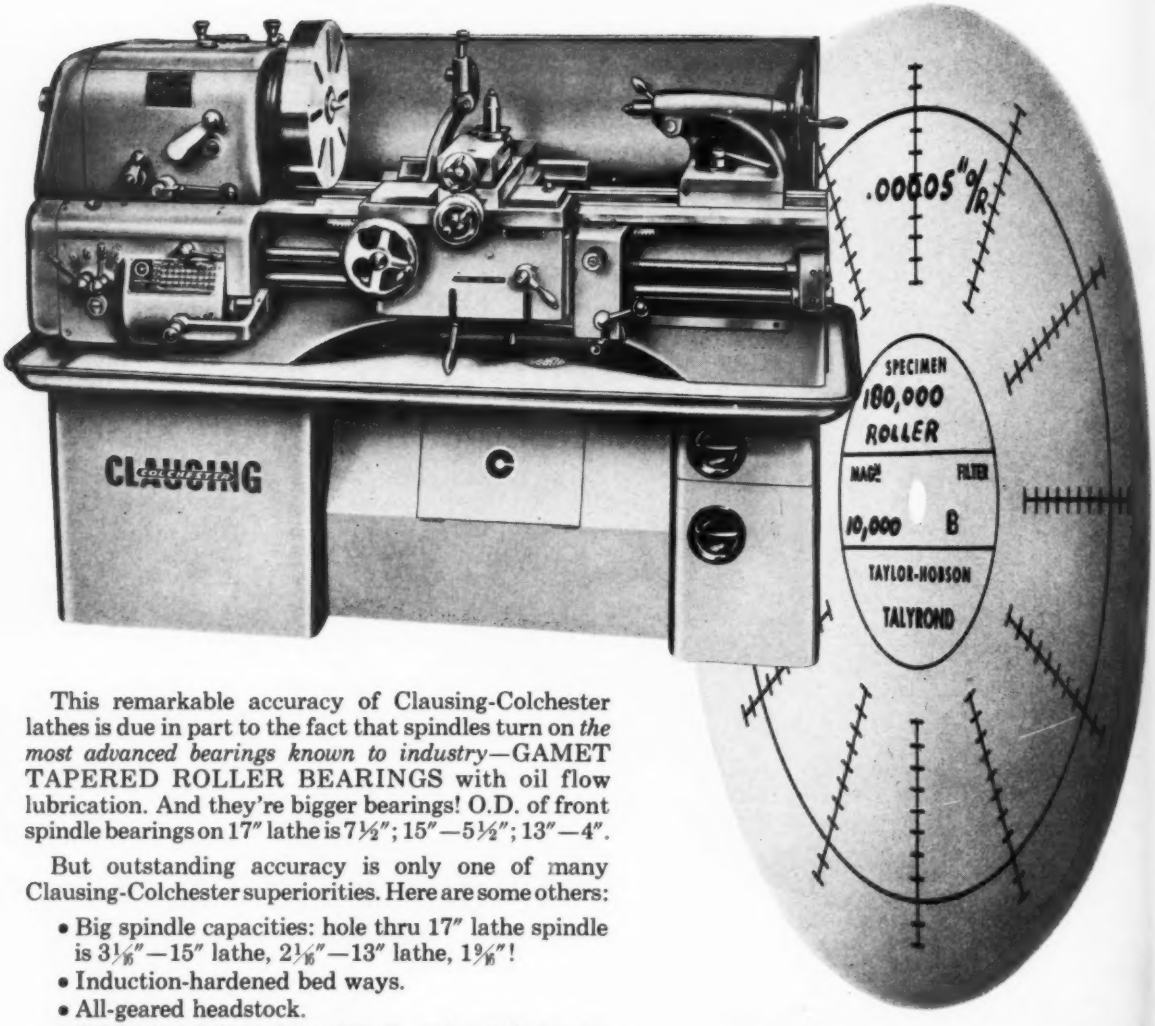
CLAUSING COLCHESTER GEARED-HEAD LATHES *turn* ROUND *within* .0001"



This remarkable accuracy of Clausing-Colchester lathes is due in part to the fact that spindles turn on *the most advanced bearings known to industry*—GAMET TAPERED ROLLER BEARINGS with oil flow lubrication. And they're bigger bearings! O.D. of front spindle bearings on 17" lathe is 7½"; 15"—5½"; 13"—4".

But outstanding accuracy is only one of many Clausing-Colchester superiorities. Here are some others:

- Big spindle capacities: hole thru 17" lathe spindle is 3 1/16"—15" lathe, 2 1/16"—13" lathe, 1 9/16"!
- Induction-hardened bed ways.
- All-geared headstock.
- Oil bath lubricated headstock and quick-change gear box.
- Separate feed rod for power feeds.

Best of all, Clausing-Colchesters are the greatest lathe values you'll find anywhere. Prices for the 13" straight bed model start at $2440; 15"—$3415; 17"—$5100. Prices include motor and magnetic controls. Gap bed and profiling lathes available in all three sizes.

Get ALL the facts. Write for descriptive literature on the "Greatest Buys in Lathe History!"

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Every Clausing-Colchester must turn round within .0001". Accuracy is checked by inspecting a turned work piece on a Talyrond which measures and records in millionths on a graph like the above. Work piece and graph are supplied with each lathe as proof of its superior accuracy.

356

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OUTSTANDING VALUES IN PRECISION MACHINES

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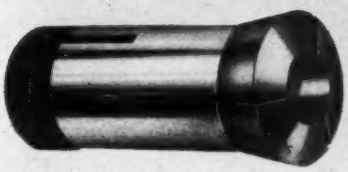

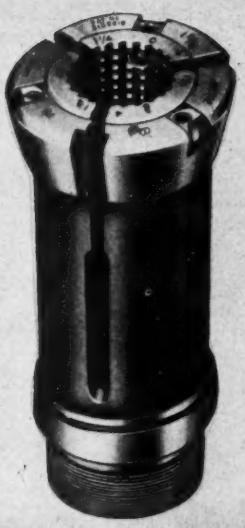

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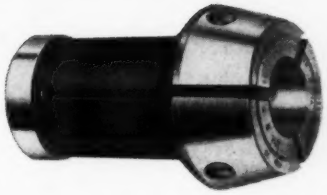

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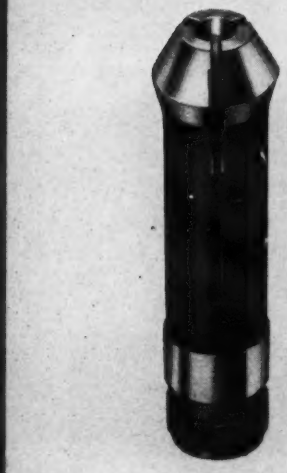

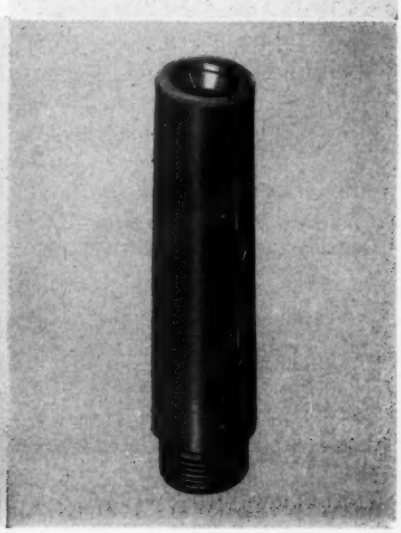

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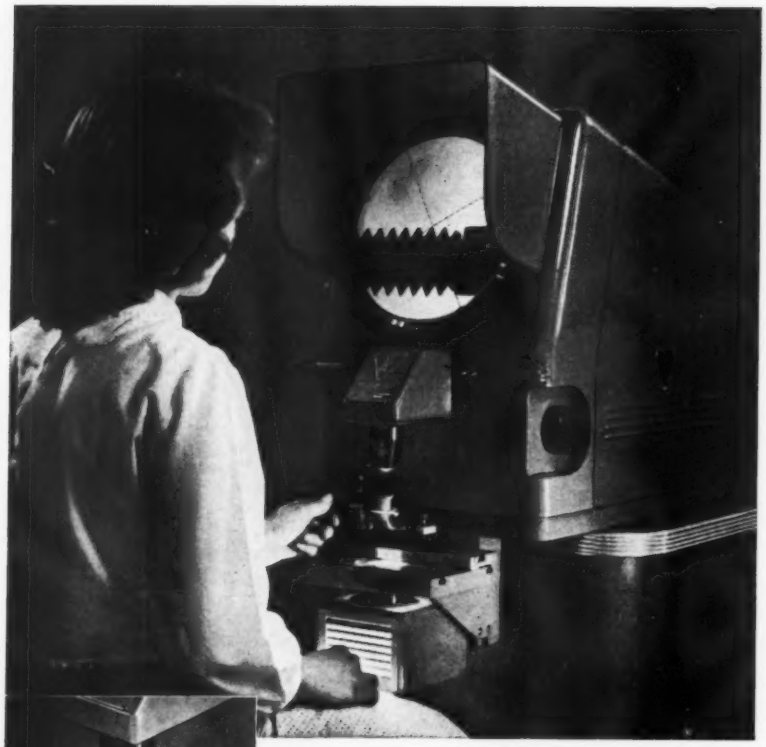

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CIRCLE INFORM-A-GRAM KEY NO. 8

Talk of the Month

Maintaining A Complex Electronic Installation

by Thomas R. Darmody

Mr. Darmody is Vice President — Engineering, The M & T Company, Philadelphia, Pa.

Efficient maintenance makes the difference between smooth operation and unpredictable shutdowns. The bigger and more complex an electronic installation, the more precise the maintenance program must be.

ELECTRONICS has branched out into the factory. There are thousands of plants around the country that use electronic controls in one phase or another of production, and increasing numbers of these plants are turning over part of the control of production to computers.

This is no fad; the computer is becoming a respected member of production management. But these exceedingly complex electronic systems cannot and will not do a job unless they are properly and efficiently maintained.

The problem of maintaining a complex electronic installation breaks down into the two general categories of preventive and corrective maintenance. But even before programs of maintenance and troubleshooting can be set up, there are decisions that must be made.

Lease or Buy

A criterion for initial decisions is whether or not the major electronic system or systems is leased

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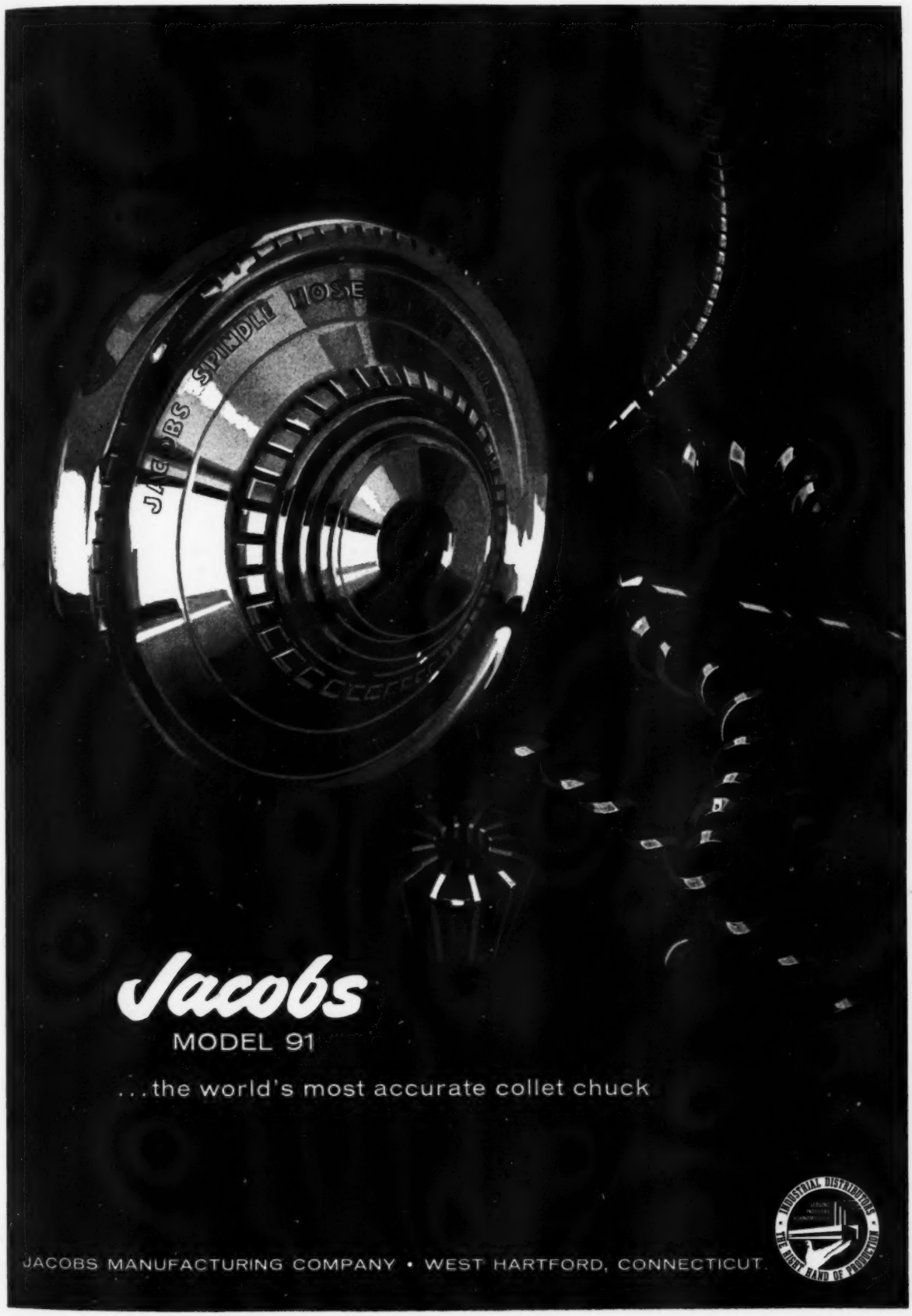
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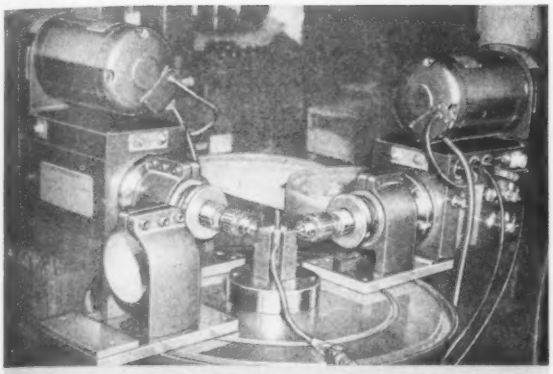

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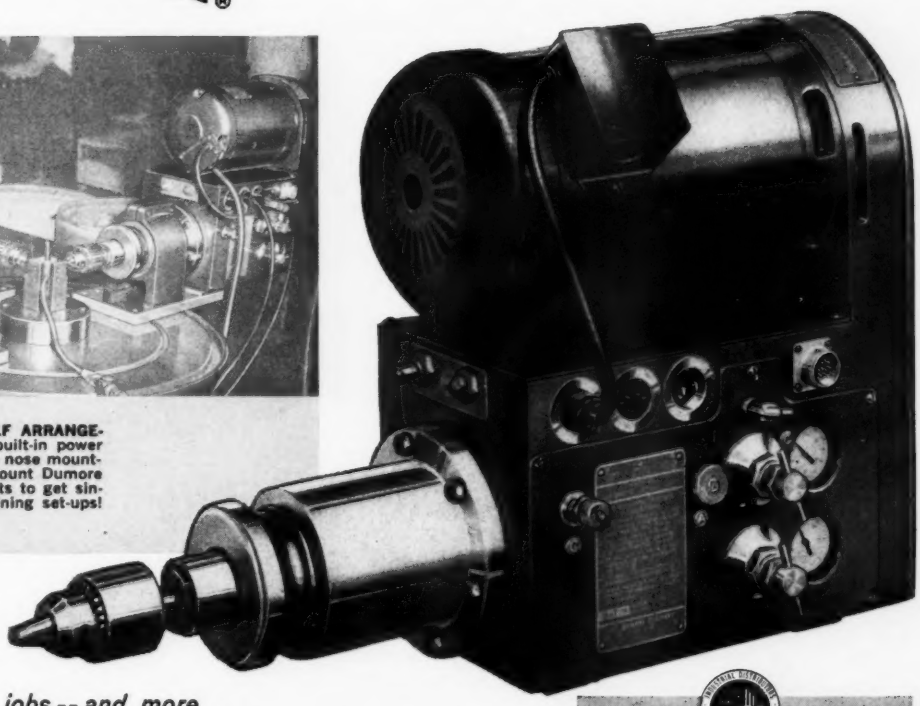

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CIRCLE INFORM-A-GRAM KEY NO. 11

. . . Month's Talk from page 8

or owned. In the first days of computers, many users bought their systems. Then it became apparent that obsolescence and innovation were reducing the value of the initial investment, while maintenance and operating costs represented a continuing high expenditure of unpredictable size; to ease budgeting and planning problems, many users began to rent or lease. Now there seems to be a resurgence of the buying trend, due principally to the advent of more reliable electronic circuitry.

Setting up a maintenance force for a vital electronic system can be an extremely difficult procedure. Technicians are highly specialized people, it would take months for an expert repairman to be able to work as a computer technician. Procedures vary, depending on the built-in maintenance aids and a computer system maintenance staff can become quite expensive.

A lessee may find it expedient to contract for maintenance from the builder. If it is purchased, the buyer can still contract for maintenance. But more and more, users find it wise and economical to contract for maintenance from a specialist, not the manufacturer.

Regardless of your maintenance plan, it must be considered well in advance of the computer installation. It should be working the day the system begins to operate. The cost of inoperative time is far greater than the cost of sensible maintenance.

Maintenance Time

Another point must be considered prior to setting up a program: Electronic systems cannot be made to work all the time unless the equipment has been designed at 100% redundancy or better. Most computers are not and must be partially or completely shut down for their maintenance work.

Early vacuum tube systems were built to operate about 80% of the time; 15% of the time had to be for preventive maintenance, and 5% was maximum downtime due to failure and corrective maintenance. Percentages here were based on a 168-hr week. For a system operating only 8 hr/day the figure will be close to 95% —maintenance can take place in off hours.

Since the development of transistors and magnetic amplifiers, the use figure has improved substantially. This is partly due to greater reliability and partly to new maintenance aids and faulty alarms. Part of the credit also goes to the use of solid-state pull-out components.

Preventive Maintenance

Maintenance for a digital computer is customarily set up on an interlocking complementary schedule on daily, weekly, monthly or a quarterly basis. In any event, the manufacturer's recommendations should be followed until experience has provided the foundation for independent action.

Daily maintenance must preempt half an hour or an hour of the computer's time prior to beginning of the day's work, or — if on a three-shift operation — at the turnover of one of the shifts. Often no more than a careful in-

. . . Continued on page 16

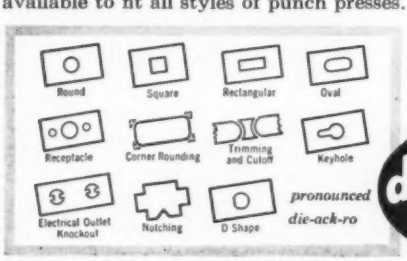
ACCURACY ASSURED
with
DI-ACRO PRECISION PUNCHES AND DIES

Immediate Delivery from factory stock

Accurate hole location is easily achieved with Di-Acro Precision Punch and Die sets because the centering point on the punch is ground concentric to the cutting edges, there is no "slop" even when several holes are punched in a blank. Hole sizes are accurate due both to the high degree of concentricity of the punch and die set and the choice of clearance which allows you to obtain clean, burr free holes no matter what material thickness is to be perforated. All Di-Acro punches and dies are precision made of high quality tool steel.

Over 500 standard sizes of Di-Acro Precision Punches and Dies in 12 standard styles are stocked. Punch Adapters and Die Holders are available to fit all styles of punch presses.

For multiple hole punching ask about the new Di-Acro Adjustable Punch and Die Sets.



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Consult phone book Yellow Pages under Machinery—Machine Tools for your Di-Acro distributor or write for catalog and prices.

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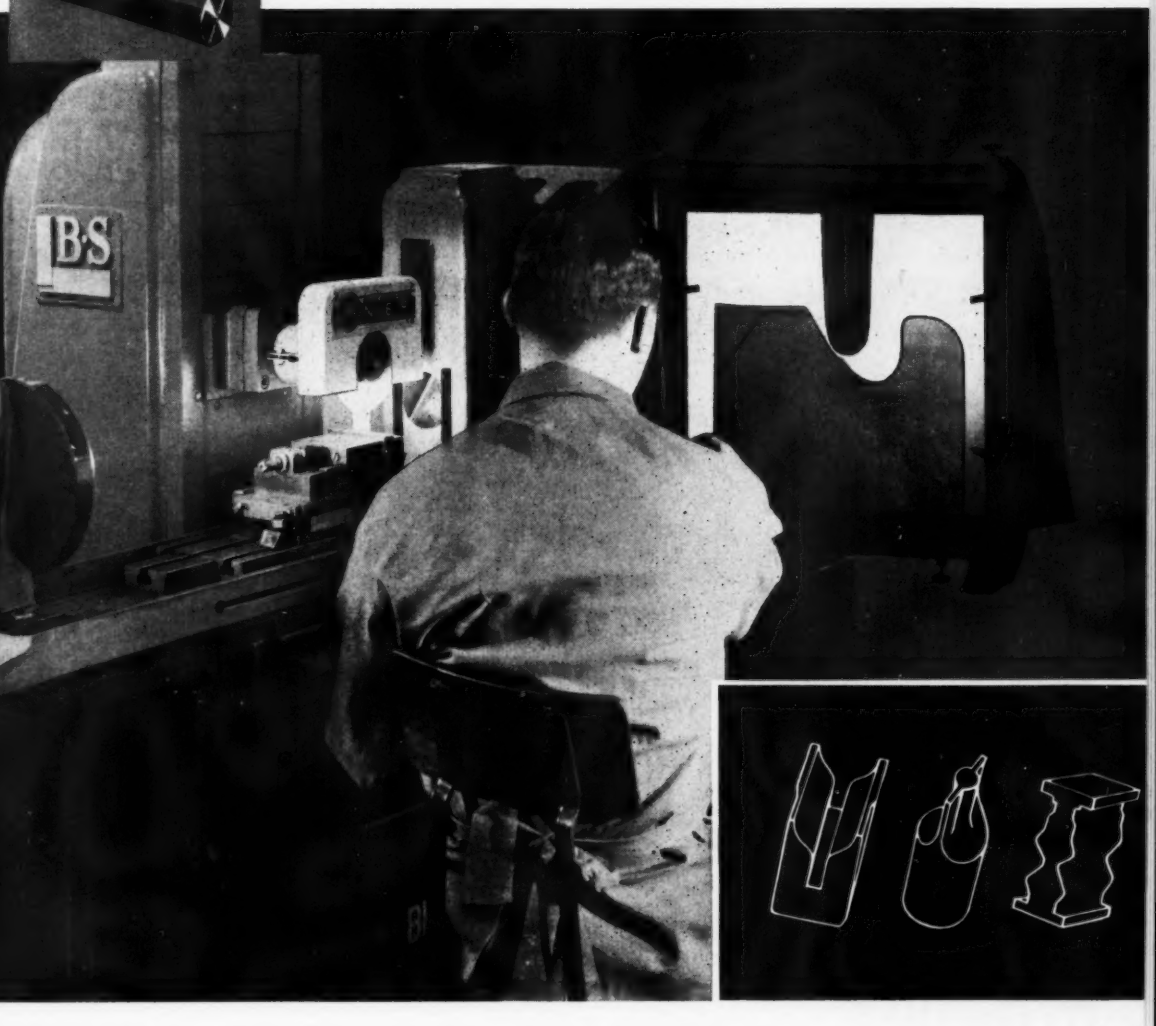


Up to 300% faster form grinding in carbide, ceramics – Brown & Sharpe MICROMASTER with VISUAL GRIND

VISUAL GRIND, the built-in comparator on the B&S 618 Surface Grinding Machine, permits tool and die makers to meet today's demand for intricate shapes in super-hard materials with spectacular savings in work hours and wheel costs.

Skilled operators can save up to 300% in set-up and grinding time. There is no need to remove work for frequent inspection with separate equipment. Semi-skilled workers, also, quickly learn to "follow the line," and match the clearly visible, true image of the work to the form layout drawn on the screen. Wheel costs are drastically reduced in grinding carbide and ceramics — any contours can be reproduced with a few simple wheels.

An unlimited variety of forms can be produced in punches, dies, and similar work — with through, blind, or template grinding — using standard equipment and simple attachments.

The MICROMASTER® with Visual Grind provides all the extra profit-saving advantages of the new B&S 618 Surface Grinder. It can be readily used for other grinding, of surfaces up to 6″ x 14″, without disturbing the optical system.

THE VISUAL GRIND® system is manufactured by The Cleveland Grinding Machine Co. and is sold only by Brown & Sharpe. For details, write: Machine Tool Division, Brown & Sharpe Mfg. Co., Providence 1, R. I.

Brown & Sharpe PRECISION CENTER

CIRCLE INFORM-A-GRAM KEY NO. 13

HARDINGE
ELMIRA, N.Y.

HARDINGE Sjogren Chucks

Quality at Low Cost

HARDINGE-SJOGREN Speed Collet Chucks for tool room lathes, engine lathes and grinders.

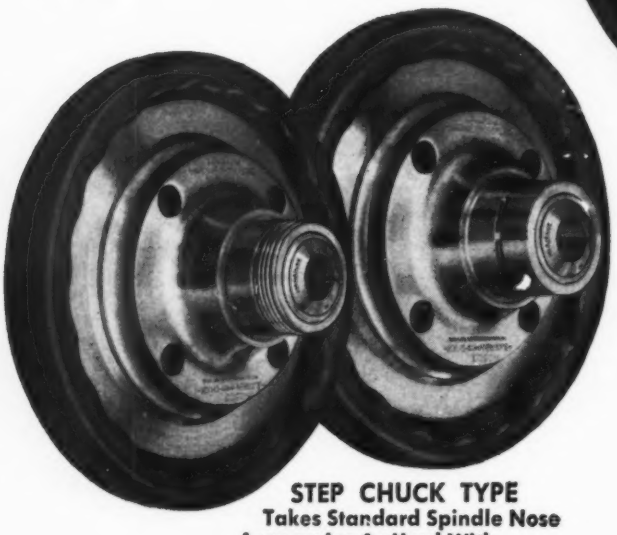
Available for Threaded Nose, Cam Lock, Taper Key Drive and American Standard Spindles.

70TH ANNIVERSARY 1890 - 1960 HARDINGE ELMIRA, N.Y.

REGULAR TYPE

AVAILABLE IN FIVE COLLET CAPACITY SIZES

1 1/16", 1 3/8", 1 3/4", 2 1/4", 3 1/2"



STEP CHUCK TYPE
Takes Standard Spindle Nose Accessories As Used With Hardinge Precision Machines

LEVER TYPE

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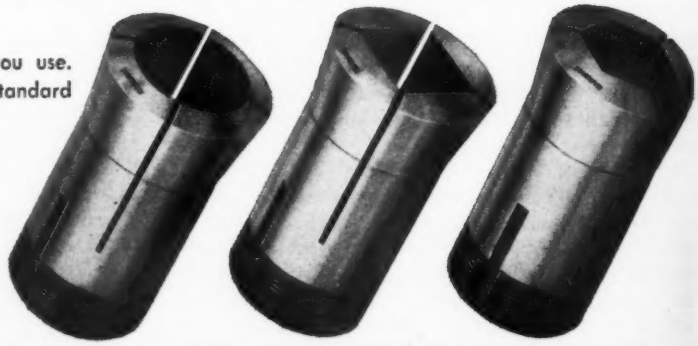
Maximum efficiency — Pay for only what you use. Records show that 82% of all sizes used are standard 16th sizes.

Buy only the sizes you use—Hardinge Collet stocks are available in Atlanta, Elmira, Oakland, Portland, Seattle, Hartford, New York, Philadelphia, Dayton, Detroit, Chicago, St. Louis, Minneapolis and Los Angeles. Springfield, N.J. and Toronto.



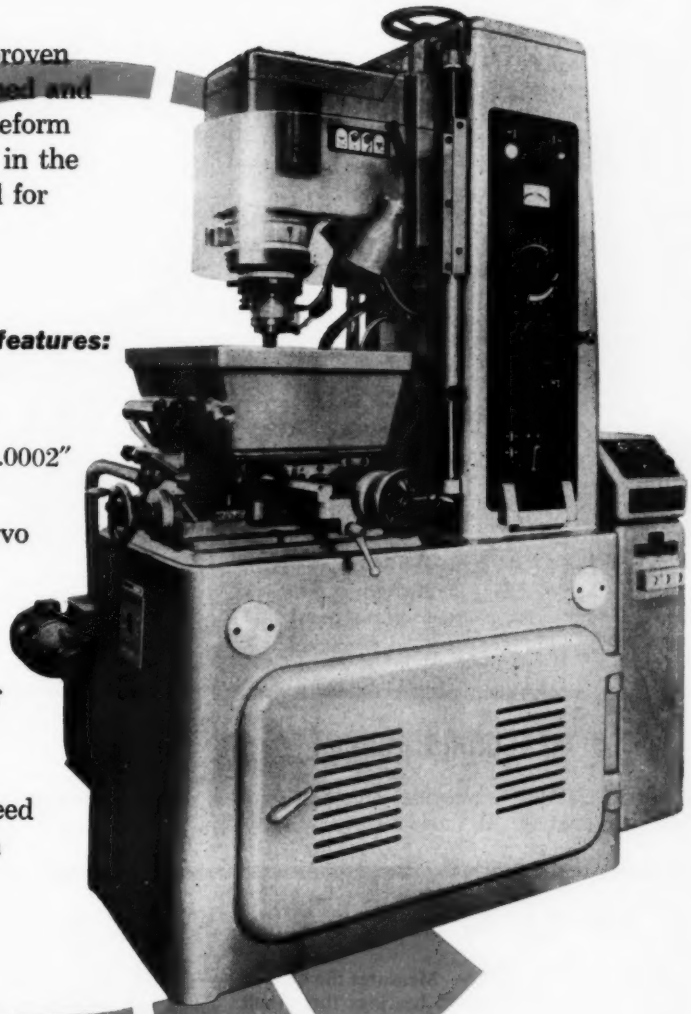
HARDINGE BROTHERS, INC., ELMIRA, N. Y. U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 14

ELERODA D1

A precision electrical discharge machine

The ELERODA D1 was the first proven electrical discharge machine designed and engineered by CHARMILLES' Eleform Department, pioneers and leaders in the electrical discharge machining field for many years.



Here are some of its outstanding features:

- Magnetic electrode holder for working and locating within ± .0002"
- Specially designed hydraulic servo
- Table with jig borer accuracy
- The most stable electrical power unit on the market (no tubes)
- Highest guaranteed machine speed at 10 micro inches surface finish
- Heavily ribbed castings used throughout
- Simple controls and fully automatic

Complete service facilities available.

Write today for illustrated brochure to:

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CHARMILLES ENGINEERING WORKS, LTD.
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CIRCLE INFORM-A-GRAM KEY NO. 15

Here's the latest inspection equipment

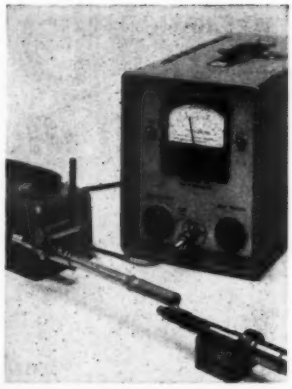
. . . FOR SURFACE MEASUREMENT

PROFILOMETER® — Measures the roughness of practically *all* machined and finished surfaces, internal and external, in microinches (arithmetical or r.m.s. average height). Fast; dependable; easy to use.

PROFICORDER® — Draws magnified profile of internal and external surfaces, showing absolute deviation from flatness or roundness. Chart shows *roughness* only, *waviness* only, or *total profile*, as desired; permits measuring height, width and spacing of waves, bows, steps, roughness and other irregularities.

MICROCORDER® — Draws magnified profile of internal and external surfaces along straight path of trace. Chart shows pits, pores, scratches, chatter marks and similar irregularities in detail.

WAVOMETER® — Measures the microinch height of waviness irregularities (r.m.s. average) around internal and external surfaces of rotation on a production basis.



The Profilometer, Proficorder and Microcorder are used on metals, paper, plastics, ceramics and many other materials.

. . . FOR MEASURING RUNOUT

VAROMETER® — Measures runout of spindles, shafts, wheels etc. while the parts are rotating. Also used for surface analysis.

. . . FOR TESTING BALL BEARINGS

ANDEROMETER® — Measures the characteristics of assembled ball bearings that result in noise and vibration, in production and receiving inspection. Enables bearing users to write *numerical specifications* (in Anderons) for overall quality of ball bearings.

WRITE FOR LITERATURE
on items of interest.

MICROMETRICAL MMC MANUFACTURING COMPANY
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WAVOMETER® • ANDEROMETER® • VAROMETER®
CIRCLE INFORM-A-GRAM KEY NO. 16

. . . Month's Talk from page 12

spection of the turn-on and start procedures, with perhaps the running of a checkout routine, is necessary. In conjunction with maintenance, a record is kept of nonrecurring faults during operation. A technician uses this report to focus attention during maintenance. His own record is also a guide.

The weekly maintenance probes deeper. It may cover a complete shift. During this check some of the annual, semi-annual or quarterly procedures may be performed.

Major maintenance procedures might be cleaning the entire system, lubricating, replacement of parts, and perhaps replacement of whole populations of tubes or other components.

Power of Logic

Maintenance for an electronic computer system — whose design is predicted on the fulfillment in electronic hardware of certain principles of logic — involves tests of circuit operation in terms of the logical results. Typical among the maintenance procedures are sequence checks, logical checks, and routines which explore the functioning of all subsystems.

Just turning on a computer tells the operator a great deal. A fixed sequence is usually prescribed for just turning it on.

Built into most are checking circuits for detecting dropped pulses or illogical groupings of either pulses or control signals. For example, a computer digit is usually made up of pulses in code. These may total to an odd or even sum within any digit, word or block of words. Counters total up each digit's or word's pulse count, and if it is not par can signal an error.

Another maintenance aid is the omnibus routine. This is a program using all of the circuitry, usually in the most demanding routine possible. It relies on built-in parity checks, and final answers known in advance. These routines are a part of weekly maintenance of most large computer systems.

Another is the marginal test. Many electronic components lose their capacity to carry current; reducing voltages applied to them simulates this condition, and is

. . . Continued on page 24

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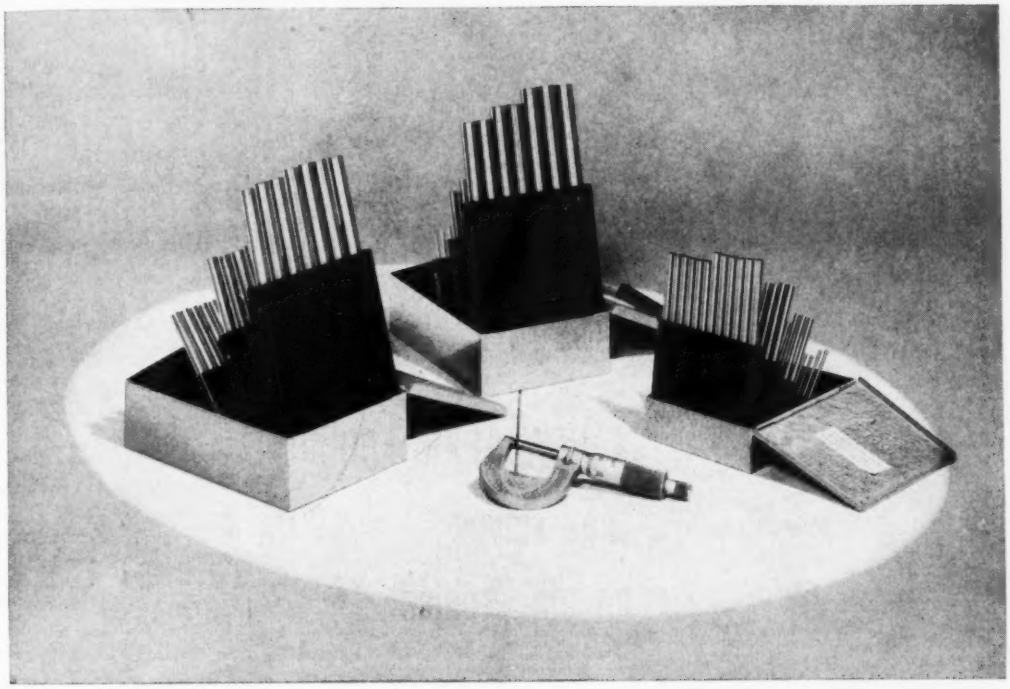
HUTCHINSON HSS BLANKS



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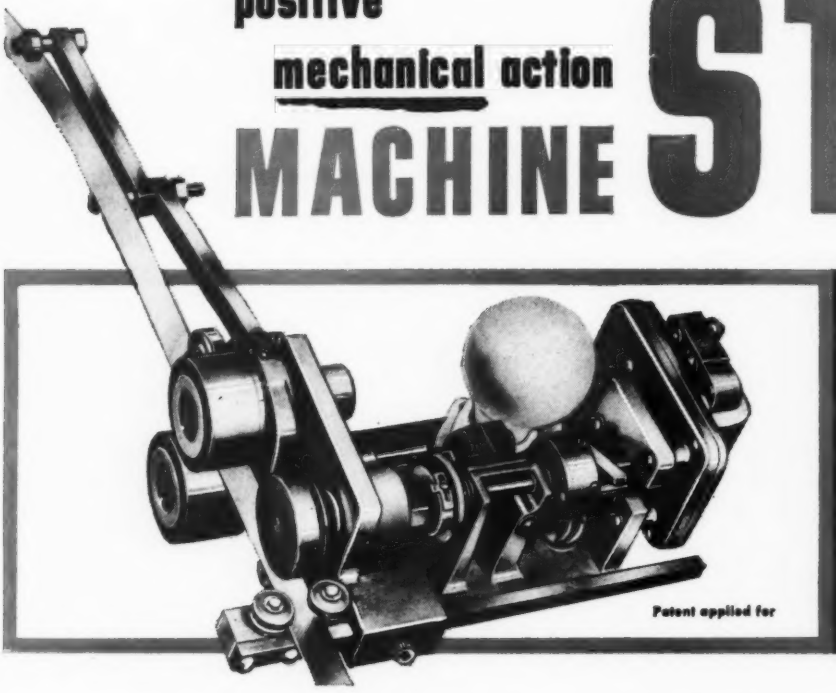
positive mechanical action MACHINE STOP



TIME TESTED . . . PRODUCTION PROVEN!

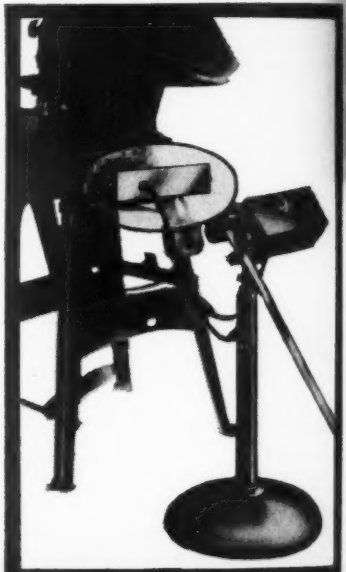
A NEW APPROACH that solves an old problem

- **ACTS INSTANTLY**
  Stops Machine when length of stock per stroke drops below a preset minimum.
  Stops Machine when stock is oversize in thickness.
  Stops Machine when stock is undersize in thickness.
  Stops Machine when defects such as burrs and tears occur in stock.
  Stops Machine when stock coil end approaches.
- **RUGGED, DEPENDABLE . . . EASY TO ADJUST**
  Has only a few simple adjustments which can be set accurately and quickly in minutes. Adjustments cannot vary, they work every time.
- **SAVES**
  Increases die life . . . saves down-time . . . saves die repair time . . . allows more machines to be run at a higher rate of speed with fewer operators in attendance.
- **ELIMINATES GUIDE-IN PROBLEMS**
  Helps as a guide for the stock entering machine.

FEED-OFF is inexpensive and versatile . . . can be easily adapted to suit your individual requirements. Contact us for further details.

RANDS PRODUCTS, INC.
DEPT. C, WILLIMANTIC, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 18



PORTABLE . . . EASY TO INSTALL

FEED-OFF can be quickly moved from one machine to another. Only a Clutch-tripping Solenoid need be installed on the machine itself . . . AND NOTHING ELSE!

CIRCLE INFORM-A-GRAM KEY NO. 19

HIGH SPEED PRODUCTION
requires drills of *highest quality*

CLE-FORGE High Speed Drills produce more holes per grind . . . faster . . . and at lower cost. They do this consistently, on job after job, because of the QUALITY which is built into them. From the selection of the proper steel, through each manufacturing operation and many inspections, no effort is spared to make them the finest and most economical drills you can buy.

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One of many heat treating furnaces, where time and temperature are precision controlled to assure highest quality in CLE-FORGE High Speed Drills.

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BAY STATE Taps have the strength and stamina to reduce costly down-time on the high speed set-up shown above. Their built-in QUALITY is your assurance of dependable performance on all jobs, whether large or small. Every step in their manufacture is quality controlled to meet your most exacting requirements for high productivity and long tap life.

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breakthrough

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OSBORN

CIRCLE INFORM-A-GRAM KEY NO. 20

CIRCLE INFORM-A-GRAM KEY NO. 21

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A New Cost-Cutting Process

● From mill stock to finished part with one stroke of this press. Multiply this by a hundred cycles per minute and watch the unit price of your finished parts hit a new low. It's the new H-P-M Smooth Edge Blanking Press with Special Hydrocam Dies that blanks most types of metal to close tolerances.

● This revolutionary new process eliminates grinding, deburring, shaving and straightening operations. Surface flatness and edge finishes equal grinding accuracies in most cases. And it's fast! Saves excessive capital expenditures in machines, in material handling, production time and process control.

● If you missed it at the show and need the complete facts in a hurry, write or call H-P-M or any of its sales offices.

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HPM

H74

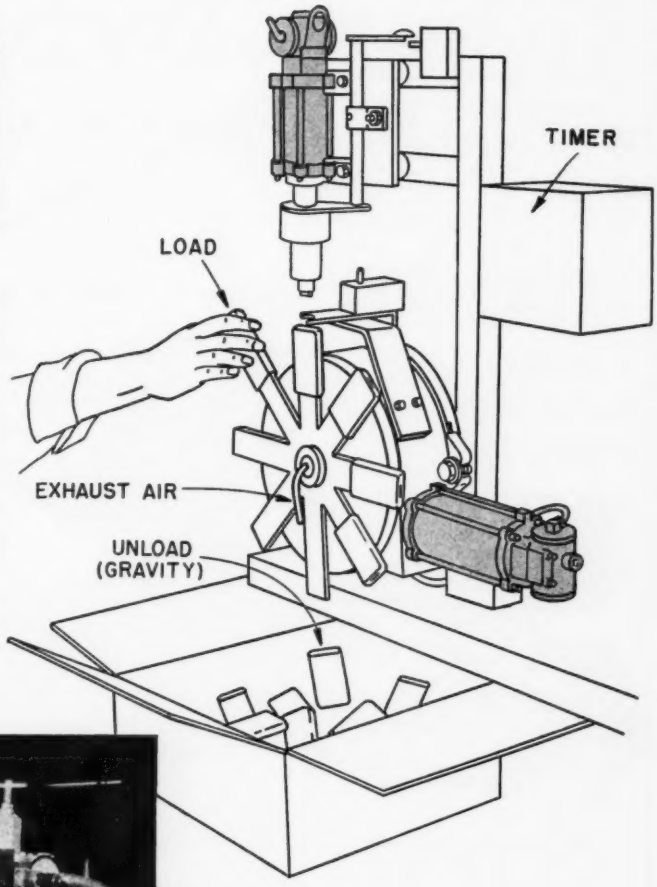
CIRCLE INFORM-A-GRAM KEY NO. 22

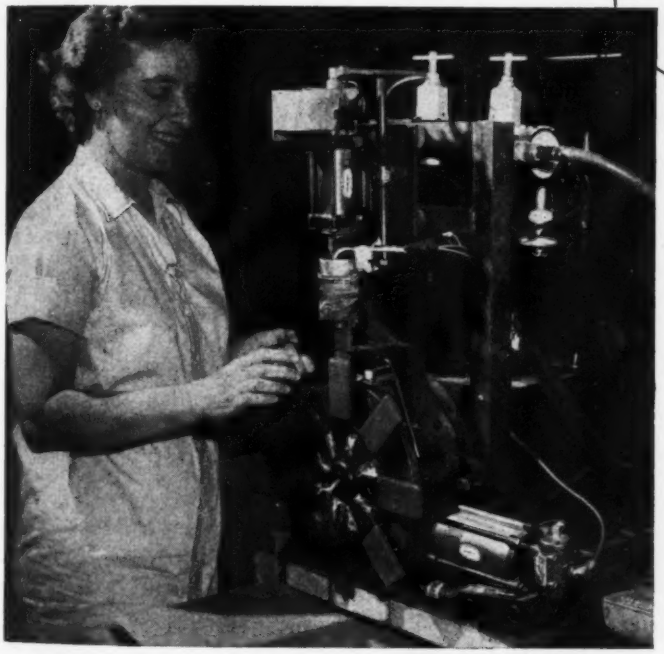
THIS SIMPLE SHOP-BUILT "FERRIS-WHEEL" CAN BE USED TO PUNCH, STAMP, HEAT-SEAL . . . OR TO FLARE, FORM OR RIVET

It's another example how versatile Bellows "Controlled-Air-Power" Devices can be used to "spot-automate" operations in almost any industry. This "SPOT-A-MATION IDEA" is based on a setup used by Frank Steere Enterprises to cut a slot in a plastic key case. But the basic idea can be adapted to perform a host of operations in wood, leather, light metals, or plastics.

It's a simple, inexpensive device. A Bellows Rotary Feed Table, mounted vertically, feeds the part to the tool attached to the piston rod of the Bellows Air Motor. The two are electrically interlocked. Bellows Rotary Feed Tables can be provided to index almost any number of positions. The unit can be equipped with a "timed dwell"; additional work stations can be set up to perform other operations on the same part; automatic feeding or ejecting devices could be installed.

Whatever you make, however you make it, Bellows "Controlled-Air-Power" Devices can help you make it at lower cost.





In this application a heated Slotting Tool is used, hence the Bellows BT-1 Timer to control the length of time the tool is in contact with the plastic part. The exhaust air from the Rotary Feed Table is used to give an assist in unloading the part.

THIS SPOT-A-MATION IDEA FILE IS YOURS ON REQUEST

Complete wiring diagrams, installation data and equipment list on the "ferris-wheel" shown, and on a score of other applications where Bellows air-powered work units are used to convert existing equipment to lower cost operation. Write for it today. Address Dept. TP-1260, The Bellows Co., Akron 9, Ohio.

1314B-3

Bellows-Valvair

AKRON 9, OHIO

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

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CUT ACCUMULATED ERRORS to a minimum

with the

DIXI 75 horizontal optical jig borer

increased
ACCURACY
VERSATILITY
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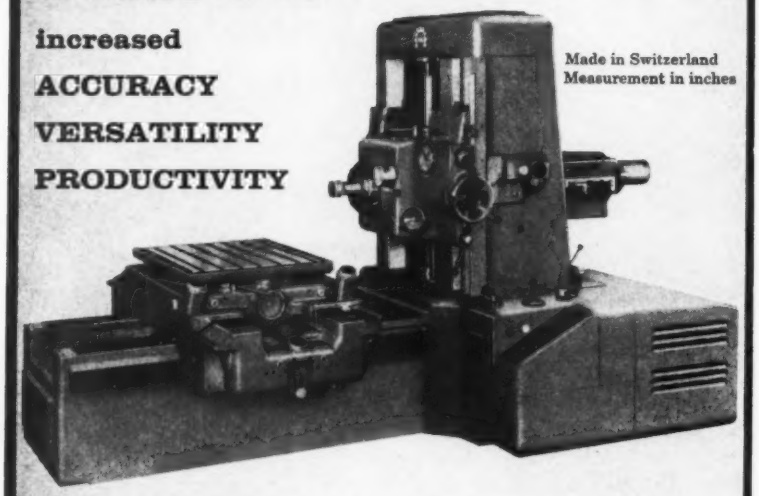
Made in Switzerland
Measurement in inches



- Automatic positioning can be changed instantly to manual operation
- Projected optical setting—direct reading to .00005" for linear motions and 1 sec. of arc for built-in rotary table. Linear optics provided with adjustable zero reference
- Simplified controls functionally arranged for greater operating speed and efficiency
- 3" diameter boring spindle
- Increased capacity: table size 39⅜" x 32"; 29⅝" cross travel; 23⅝" longitudinal travel; 25⅝" vertical travel
- Hydraulic feeds and infinitely variable spindle speeds
- Rear support optional

MBI has engineers available for consultation, guarantees service by factory trained staff, and stocks spare parts in New York.—Join the long list of leading aircraft and manufacturing plants throughout the United States which are using the horizontal optical jig borer.

Demonstrations upon request at our conveniently located demonstration centers.

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Swiss Accuracy plus U. S. Know-how

CIRCLE INFORM-A-GRAM KEY NO. 24

. . . Month's Talk from page 16

used to force failure during maintenance. During this check, an omnibus routine is run and any malfunction noted can be corrected. The correct level is established automatically through built-in controls on the power supply.

Standard Procedures

Cleanliness is one key to good maintenance; many electronic complexes which handle pulses can pick up or drop pulses easily if dirt or moisture are allowed to contaminate contacts or reduce the efficiency connections.

The few mechanical parts in electronic system are usually of a high order of precision and they must be carefully attended to. Manufacturer service data is usually adequate.

Corrective Maintenance

A computer's time is worth hundreds of dollars an hour, so waiting for maintenance is a costly business. The system chief engineer should see that people capable of performing analysis, locating trouble and instigating corrective measures are available. Standby personnel for this is not necessarily wasted overhead; invariably there are times when portions of large systems not in use and routine maintenance or overhaul can be done while the engineer or technician is standing by.

If the levels of maintenance can be divided into technician's work and engineer's work, technicians can be scheduled for off shifts while engineers are present during critical hours.

Once the offending subsystem or circuit is located, conventional corrective techniques are used to fix it. In today's computers, it is often possible to unplug an entire circuit, or subsystem, and plug in a substitute. The faulty equipment is then repaired at the bench while the computer works.

Parts and Supplies

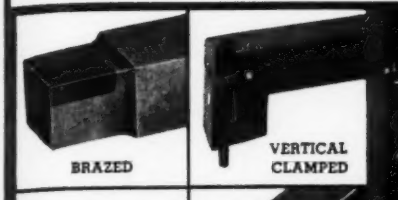
Only experience here can be a guide on amounts of components to hold in stock. Fortunately, the experience of other users is usually available.

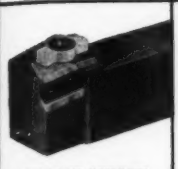
Also most computers are designed to use large populations of

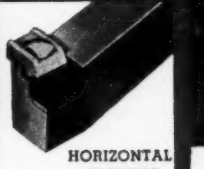
. . . Continued on page 26

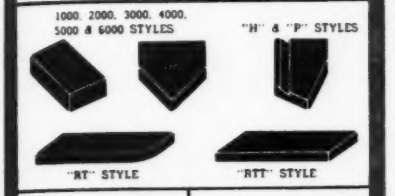
. . . ANOTHER TALIDE CASE HISTORY

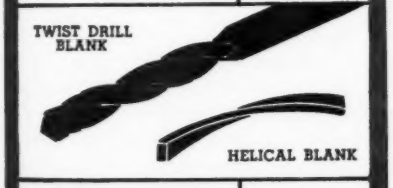
TALIDE TOOLS Produce 50% More at J.I.CASE

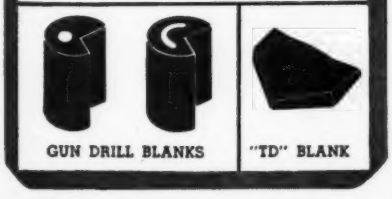


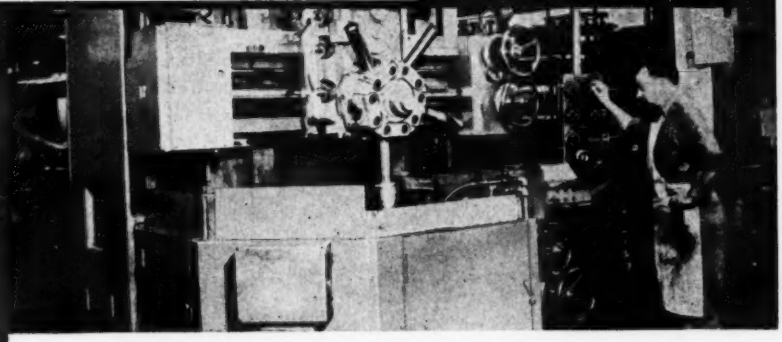






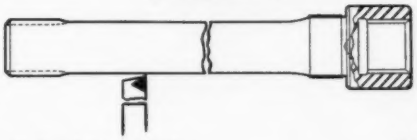




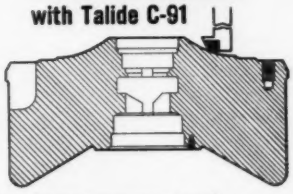


J.I.CASE® Co., Racine, Wisconsin, leading manufacturer of Agricultural and Industrial Equipment, reports Talide Tools give superior performance on both cast iron and steel jobs.

18 Shafts machined with Talide S-92



600 Wheels machined with Talide C-91



Main drive shaft 15/16" dia. x 16-15/32" long	**Part**	Rear tractor wheel 15" dia. x 7-19/32" thick
H.R. A-8640 steel 285-321 Brinell	**Material**	Hi-nickel cast iron SAE111
Turn O.D. of Shaft	**Operation**	Face outer edge of wheel hub, 1/2" wide cut
Carbo-matic	**Machine**	Bullard
#TN-163P3 Talide Disposable insert 1/2" I.C. x 3/16" thick, negative angle, 3/64" corner radii, Grade S-92	**Tools**	#GL-20 brazed tool, off-set style, 1-1/4" x 1-1/4" x 8" shank size, Grade C-91
1/16"	**Depth of Cut**	1/8" to 1/2"
.009	**Feed**	.033
	Speed	
115	**(S.F.M.)**	210
450	**(R.P.M.)**	39
Soluble Oil	**Coolant**	dry
Talide Grade S-92	**Results**	Talide Grade C-91
Machined 18 shafts per grind. Next best premium grade produced only 12 shafts.		Machined 600 wheels per grind compared to 400 for next best premium grade.

HERE'S OUR OFFER!

Our Service Engineers will furnish and test a Talide Tool on any job you designate—free of charge. Write for Catalog 59-G. Metal Carbides Corporation, 6001 Southern Blvd., Youngstown 12, Ohio.

METAL CARBIDES CORPORATION
TALIDE®
YOUNGSTOWN 12, OHIO

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HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

CIRCLE INFORM-A-GRAM KEY NO 25

ASSEMBLE PARTS FASTER . . . WITH FEWER REJECTS!

PEDESTAL TYPE

SELF-CONTAINED DRIVING HEAD

DPS model U power screwdriving machines

- Maintain constant driving torque with new positive control clutch
- Dependable motorized hopper drive with safety clutch protects motor and gears in the event of jamming
- Release screw by body or head with new feed track and escapement mechanism

Write today for DPS Model U Bulletin

You can drive up to 40 screws per minute with a DPS Model U. Nuts are driven equally fast . . . with accuracy that cuts parts waste, improves assembly quality.

DPS offers the Model U in two types: pedestal, and self-contained driving head. Both require minimum space and are readily adaptable to your work flow. Feed track and escapement mechanism mounts on either side of the machine column for right- or left-hand assembly. The versatile self-contained driving head is ideal for use in automatic assembly machines incorporating dials and straight-line transfers.

The Model U drives screws from #6 x 3/16" long to 1/4" x 1 1/2" long . . . and can be equipped with 12" or 16" barrel feeders.

DETROIT POWER SCREWDRIVER COMPANY

2827 W. Fort St. • Detroit 16, Michigan
A Subsidiary of Link-Belt Company

15,334

CIRCLE INFORM-A-GRAM KEY NO. 26

. . . Month's Talk from page 24

only a few kinds of standard components thus reducing the supply problem.

Of critical importance to the maintenance is efficient test equipment. Precision oscilloscopes, voltmeters capable of measuring values in pulse circuits, tube checkers that can simulate pulse conditions, and other maintenance tools required in maintaining a computer are quite costly, but again the cost is small compared to downtime.

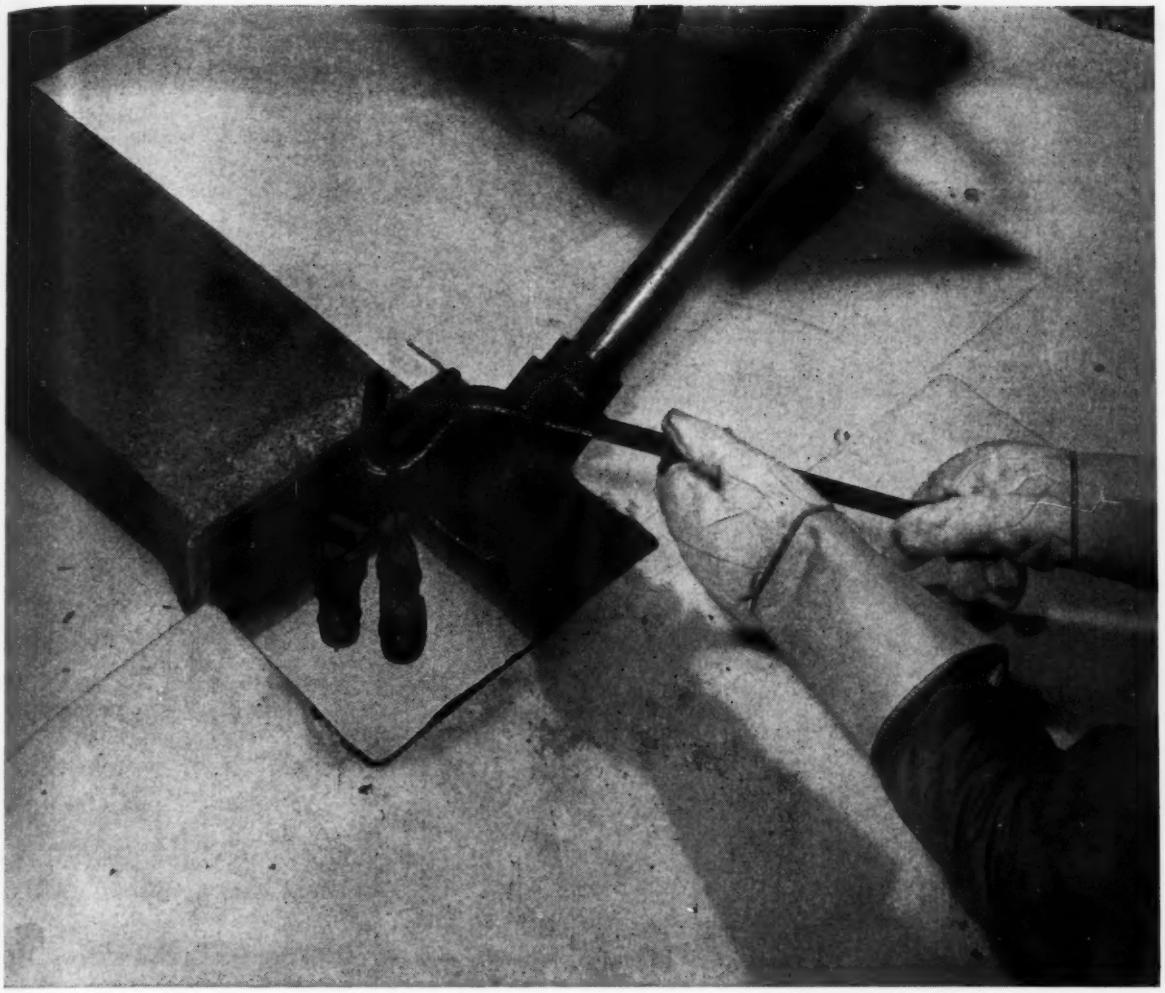
Arc Welding Competition Announced

Progress in arc welding is the theme of a $25,000 award program being sponsored by the James F. Lincoln Arc Welding Foundation, Cleveland. The competition is open to any U. S. resident who has taken part in the design, planning, or production of the design described in the paper he submits as his award program entry.

Separate awards will be made for machine design and structures, with half the award money earmarked for each category. In the machine design area, papers must present a discussion of the use of arc welded steel in the design of either a complete machine or a machine component. These will include achieved or expected results relating to performance, appearance, savings in material, time and/or money made possible through arc welded design.

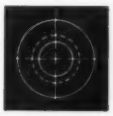
Thirty-eight winners will share in the awards in each category. Top prize money in each of the two divisions will be $3000, and there will be 20 sixth place awards of $100 each.

Complete rules and related information may be obtained from the James F. Lincoln Arc Welding Foundation, Box 3035, Cleveland 17, Ohio. Competition closes July 17, 1961.



WE TURN THE HEAT ON AT RICHARD BROTHERS

to take the heat off you. Punches might look alike—but quality can't always be seen. Take Richard Brothers advanced heat-treating process, for example. Our electric salt-bath furnace is tailored specifically to the treating of punches and die buttons, which allows us to maintain more rigid specifications. Result? Our punches are tougher, have a higher resistance to impact, will wear longer, and perform more consistently. You can promise your customers the highest quality work . . . *delivered on time.* Next time, be sure to specify Richard Brothers punches, dies and related tools for all your metal-piercing needs. It pays to do business with the leader.



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QUALITY

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ALLIED PRODUCTS CORPORATION
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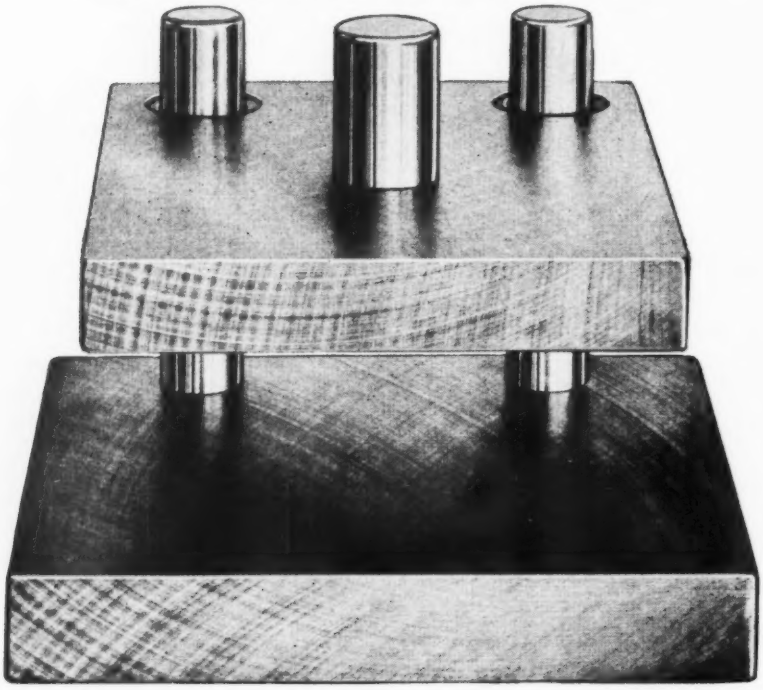
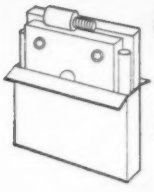
Top Quality — Bottom Prices

ECONOMY

STEEL DIE SETS





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in Handy Kit Form

E **ECONOMICALLY** produced by volume buying and modern equipment to offer you all steel accurate die sets for low tool costs.

C **CONVENIENTLY** packaged for easy and safe handling.

O **ORDERED** with your choice of three common pin lengths—and two shank sizes—no extra charge.

N **NET PRICES**—1 to 9 sets. Generous discounts for quantity orders.

O **ORDERS** shipped directly from stock. No waiting for assembly or packaging.

M **MORE** die area on die holder if required, or can be used for clamping space.

Y **YOUR** toolmaking time is reduced by spotting die sections, and drilling or machining die holder before the pins are installed.

These Die Sets Warrant Your Investigation

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CIRCLE INFORM-A-GRAM KEY NO. 28

Carnegie Tech Teacher Honored

A native Englishman who is associate professor of metallurgical engineering at Carnegie Institute of Technology was recently honored by the American Society for Metals with its $2000 Bradley Stoughton Award.

Dr. Harold W. Paxton, 33, received the award for exemplary work in teaching metallurgy. Dr. Paxton first came to Carnegie Tech as an E. C. A. fellow in 1949, after earning his B.S. and M.S. degrees from the University of Manchester, and a Ph. D. from the University of Birmingham.

He went back to England from 1950-53 as a research fellow at the Univ. of Birmingham, then returned to the Pittsburgh institution in 1953, receiving his associate professorship in 1958. Besides his teaching contributions, he has authored articles in leading professional journals.

New Firm Makes Carbide Tools

Carbitool, Incorporated, is the name of a new firm that recently opened offices and facilities for manufacturing solid carbide cutting tools in Hazel Park, Mich.

The company is a subsidiary of Futurmill, Inc., and will offer a special rush tool service on reamers, end mills, burrs, etc.

Presteel Award Winner

Clement C. Caditz, President of Northern Metal Products Co., recently received the Presteel Award at the Annual Meeting of the Pressed Metal Institute, for the development of cost reduction systems for stampers. This award is presented each year by the Worcester Pressed Steel Co. to the individual or institute making a substantial contribution in the field of metal stampings.

Want to cut costs on parts like these?

Here's how tracing will help you save

The simple, basic setup shown above handles nearly 300 different parts for a well-known manufacturer of drive line components. All work is performed on one Gisholt MASTERLINE No. 4 Ram Type Turret Lathe with a JETracer on the rear of the cross slide. Standard tools on the hex and square turrets are used to face, chamfer and reduce the stock while the JETracer finishes all diameters, steps, blends and radii. The 6⅝"-long, 2"-diameter stepped shaft (above at left) is typical and is completed in two operations with total f.t.f. time only 4.95 minutes.

Here are just a few things the JETracer can do for you:

- Shorten setup and change-over time
- Simplify machining and eliminate operator errors
- Save cost of form tools, multiple tool blocks and holders
- Reduce inspection time (only one length and one diameter need checking)
- Minimize or eliminate secondary operations (through finer finish, greater accuracy)
- Increase production through automatic machining of complex surfaces
- Free operator to handle extra units or perform other work

Gisholt has developed a complete line of JETracers for use with ram and saddle type turret lathes, automatic turret lathes and single-spindle chucking lathes. These include rear cross slide, turret and independent slide mounted units, single or multi-pass types. *All are designed to operate at full capacity of the machines to which they are applied, without limiting machine functions or restricting the use of standard tools.*

You'll want to see for yourself how the JETracer adds flexibility, speeds operations and cuts costs on standard and problem parts. Send the coupon today for your free copy of the new JETracer catalog, or call your Gisholt Representative for complete information.

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Madison 10, Wisconsin

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Please send a copy of the new Gisholt JETracer catalog.

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City..... *Zone*..... *State*.....

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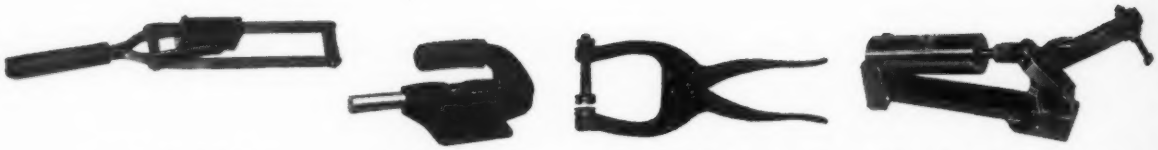
UNIVERSAL TOGGLE-ACTION UNI-KLAMP

quick, positive, sturdy

Universal's Toggle-Action Uni-Klamps are engineered to give positive action with a minimum of force required for locking or unlocking. They're the fastest and most economical work-holding devices yet designed and they incorporate features recommended by independent tool designers, process engineers, tool makers and machinists. With clamp pressures available from 200 to 1200 lbs., there's a Universal Uni-Klamp in a size and type to suit your requirements. Write for catalog showing complete line.



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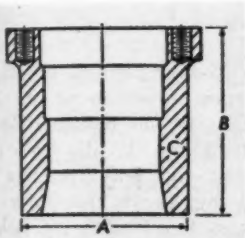
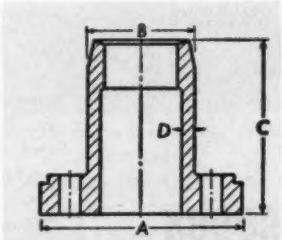
THIS HOLE IN GRAPH-MO HOLLOW-BAR®

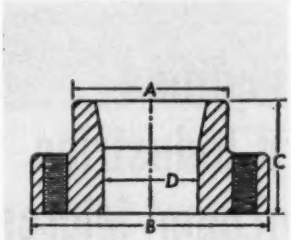
lets you make ring-shaped tool steel parts faster, at less cost



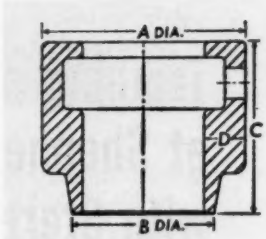
BLANKING AND FORMING PUNCH



FORMING AND PIERCING DIE



SIZING DIE



SIZING SLEEVE

START making your ring-shaped tool steel parts with Graph-Mo Hollow-Bar® and you save one operation immediately. You eliminate drilling because the hole is already there. Your first step is finish boring. That's just the start of your savings. You can make parts faster because Graph-Mo machines 30% faster than ordinary tool steels. The free graphite in its structure is the reason.

Graph-Mo wears longer because of the diamond-hard carbides in its structure. Users report Graph-Mo outwears conventional tool steels by 3 to 1. And there's far less tendency to pick up, scuff and gall.

And for stability, you can't beat Graph-Mo anywhere. A master plug gage machined from Graph-Mo showed less than 10 millionths of an inch dimensional change *after 12 years of use.*

For your ring-shaped parts, save as other tool makers do. Specify Graph-Mo Hollow-Bar. It will save you time and money, give you better finished products. Sizes range from 2 to 16-inch O.D. Many wall thicknesses. ***When you buy Timken steel you get . . .*** *1) Quality that's uniform from heat to heat, bar to bar, order to order. 2) Service from the experts in specialty steel. 3) Over 40 years experience in solving tough steel problems.* Write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO". *Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.*

TIMKEN® *Fine Alloy* STEEL

TIMKEN GRAPHITIC STEELS ARE AVAILABLE FROM STEEL SERVICE CENTERS IN 40 CITIES IN THE UNITED STATES AND CANADA

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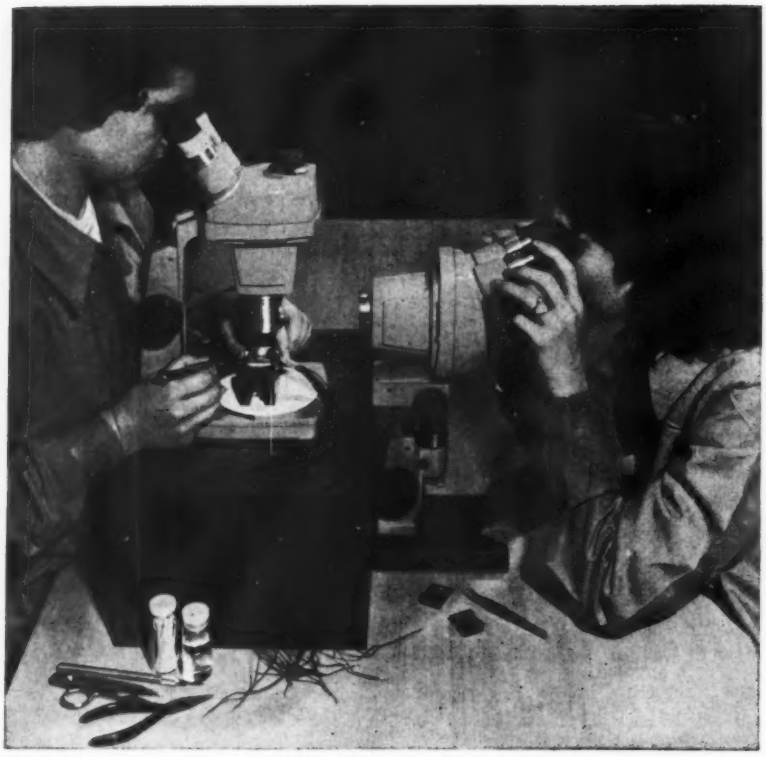

Training simplified at Shepherd Industries with StereoZoom® Microscopes

With two B&L StereoZoom Microscopes you have a training set-up you couldn't duplicate at twice the low B&L price. Use of a B&L Vertical Illuminator as a beam splitter permits two people to see the same 3-D view of the work on the stage. Trainees learn faster from step-by-step instruction. Supervisors can monitor work without interruption. Shepherd Industries, Inc., Nutley, N. J.—manufacturer of micro-miniature magnetic heads for computer systems finds this set-up "invaluable for training personnel in assembly and inspection, and for consultation in design, development and production."

And, of course, you get all the advantages that have made the B&L StereoZoom line the best-selling microscopes of all time: continuously variable magnification at the touch of a dial; constant working distance, ample for assembly operations; self-contained optical systems, inter-changeable in any of 6 basic stands. Find out how B&L StereoZoom Microscopes can solve your assembly and inspection problems.

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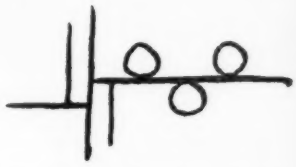
CIRCLE INFORM-A-GRAM KEY NO. 32

Lease Plan Geared To Government Research

Interest in government contract research and development work may be intensified by the introduction of a new lease plan for machine tool companies engaged in such work.

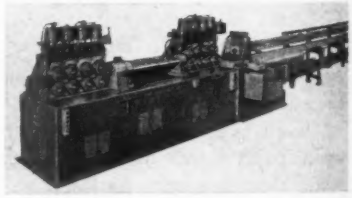
The "R & D Lease Plan," as Nationwide Leasing Co. calls it, features terms from three to five years, and includes a standard cancellation clause. The Chicago firm says leases of a range of apparatus from environmental test equipment to machine tools are possible with the plan.

Big Rod Cutter Delivered



This 23-ton giant is reportedly the largest machine of its kind yet built. It was designed to cut and straighten 1" dia rod from the coils, and was recently delivered by Lewis Machine Co., Cleveland, to a leading steelmaker.

The Model 12-FA is 85' long, has a 60' cutoff, and represents about 3000 hrs of drawing board and research time.



Name Changes Listed

Two metalworking firms recently announced changes in their corporate names.

Superior Die Set Corp., Milwaukee, was formerly Superior Steel Products Corp., and the former Blumberg Supply Corp. has become the Alisco Company, a division of Allmetal Screw Products Co., Inc. The latter firm, Alisco, moved from Hempstead to Garden City, Long Island, N. Y.

Val Koller tells why he continually adds more Moore Jig Borers and Jig Grinders to his team

This is another in a series featuring the views of owners of leading tool and die companies.

by **VAL KOLLER**
President
Koller Die & Tool Co.,
Milwaukee, Wisconsin
Manufacturer of Dies
and Metal Stampings—
Tools—Jigs—
Fixtures and Gages—
Special Machines

Moore equipment in Koller plant, with new #3 Jig Grinder in foreground.

"Since our foundation in 1919 it has been my personal objective to strive for perfection. Since that time perfection has evolved into a .000010" word for tool and die makers. Such precision is rapidly becoming common-place...particularly in electronics and guided missile fields of production. With the installation of Moore equipment in 1950, we have been able to compete successfully in a caliber of work that before was not possible.

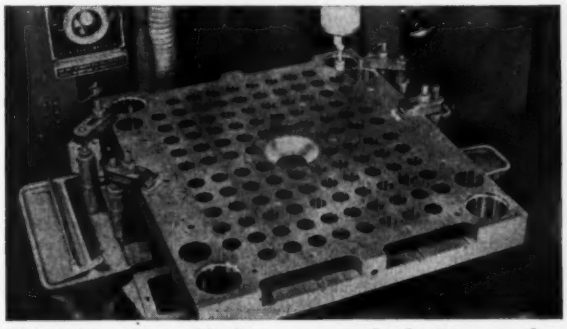
"Since that initial investment in a Moore Jig Grinder we have continually added Moore teammates to our toolroom. Today we operate more Moore equipment than any other top contract shop in the greater Milwaukee area.

"The tolerances and intricate contours now required make Moore Jig Borers and Jig Grinders a must in each toolroom. These machines operate at full capacity each workday with negative downtime due to mechanical failures. In fact, we have found that it costs real dollars and cents to operate *without* Moore equipment.

"This cost factor is just one of many reasons why we recently added another teammate to our toolroom ...the new Moore Model #3 Jig Grinder. This machine, with its tenth-splitting accuracy, hardened ways and wider range, enables us to service more customers better."

Write today for literature describing the unique features of #3 Moore Jig Borers and Jig Grinders or see our catalog in SWEET'S MACHINE TOOL FILE.

MOORE SPECIAL TOOL COMPANY, INC.
726 Union Avenue, Bridgeport, Connecticut



This 116 cavity mold plate was completely jig ground at Koller on a Moore Jig Grinder. Tolerances: hole location ± .0001", hole diameter ± .0001".

HOLES, CONTOURS AND SURFACES, tells how to produce tools and dies *the modern way.* 424 pages, 495 illustrations. $5 in U.S.A. $6 elsewhere.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

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INSERTED BLADE

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FULLY ENGINEERED BLADE GRIND...

Increased cross section at the cutting edge provides Greater Thermal Efficiency—Longer Tool Life than competitive blades.

FREER CUTTING ACTION

Exclusive Erickson method of grinding cutting angles gives Freer Cutting Action since end pressures are reduced.

"Heeling" eliminated.

EASY-TO-USE GRINDING FIXTURE...

Restores Original Factory Grind eliminating biggest obstacle to use of Spade Drills.

All cutting angles maintained during successive regrinds to original factory grind.

SPADE DRILL HOLDERS CORRECTLY ENGINEERED

"Funnel Effect" provided in flute design to speed chip escape.

Scientific distribution of coolant over whole cutting edge.

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Send Your Drilling Problems to

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COLLET CHUCKS • EXPANDING MANDRELS • AIR-OPERATED CHUCKS • FLOATING HOLDERS • TAP CHUCKS
• AUTOMATIC INDEXING • MASTER SPACERS • DIAPHRAGM CHUCKS • PUSH-ON ARBORS • QUICK-CHANGE HOLDERS
• EXPANDING COLLETS • END-CLAMPING CHUCKS • AIR CYLINDERS (allowing stock to pass through)
• EXPANDING JAW MANDRELS • SPECIAL HOLDING FIXTURES (including gear-holding)
• BORING BARS • SPADE DRILLS • RECESSING TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 34

The Editorial

QUALITY CONTROL — A CONTINUING CHALLENGE

QUALITY CONTROL TECHNIQUES as we know and practice them today have been refined over the years to what we would like to term a pretty foolproof system.

But, as many a manufacturer has found to his financial embarrassment this does not always check out.

Whatever the specifications of your products or components, you have a wealth of measuring, testing, and inspecting equipment to draw on.

Necessity being the mother of invention, there is no question but that the art of Quality Control instrumentation has more than kept up with the demands of industry.

If you are faced with a dimensional tolerance of a few millionths of an inch you can measure it with amazing repeatability. Whereas you used to measure surface "roughness," you now measure surface smoothness in terms of two or three microns.

All specifications you may have to meet can be verified by instrumentation; measuring tools and gages for checking size, shape, hardness, ductility, quantity, color, texture, ingredients, noise, vibration, weight and balance.

Many of these determinations and verifications of quality are automatic and built into your production lines. Others are manual, requiring personnel possessing high degrees of skill, dexterity, and discrimination.

How can it be, then, with such an imposing array of equipment and skills that a manufacturer can come to feel that Quality Control is not the foolproof insurance that he expects it to be? Insurance against rejects, waste, and do-overs.

It's simply this: In the vast majority of cases, the tools and equipment of Quality Control enable you to establish a policing action. Worse yet is the fact that in too many instances the only remedial action you can take savors of locking the barn after the horse is stolen!

Rejects are a costly headache in any manufacturing program and the longer it takes to isolate and identify a faulty part the greater the loss in time, money and manpower. Further, if the fault does not show up until final inspection of a complicated assembly much of the good work that has gone before (and passed intermediate inspection) is destined for scrap, salvage, or do-over — all very expensive and time consuming — totally non-productive.

It is plain to see that the more you inspect the more costly the inspection function becomes. Carried to the ultimate, 100% inspection is the most expensive of all. The extreme cost of 100% inspection can be avoided by Statistical Quality Control which is inspection by batch or sampling methods.

The statistical techniques tell you the probability of there being an acceptable number of good products or pieces from a production run. As long as the production process "delivers the goods" in accordance with the prescribed standard of acceptability the process can be said to be under control.

In spite, however, of the high degree of refinement of the Statistical Quality Control techniques, defects still occur, get by, and will make themselves known — somewhere, somehow. And — the be all and end all of Quality Control is to keep those defects out of the customers' hands!

One way of meeting the continuing challenge of Quality Control is to be guided by the old tried and true adage: "Quality must be designed into a product; it cannot be inspected into it."

E. Willard Pennington

Editor

Thor

Everything you want in Torque Control···

and more!

Thor Uni-Tork screwdrivers and nut setters make torque control of threaded fasteners as simple as turning on a light. Operator judgment and guesswork is gone. Uni-Tork snaps out of engagement when desired torque is reached, snaps in again when applied to the work. Thor Uni-Tork air tools have external torque adjustments from 10 to 100 inch-pounds. Available on all Thor air screwdrivers and nut setters and on Thor electric tools. Your Thor factory representative or distributor will show you the tools that think for themselves. Thor Power Tool Company, Aurora, Illinois. Branches in all principal cities.

Thor POWER TOOLS

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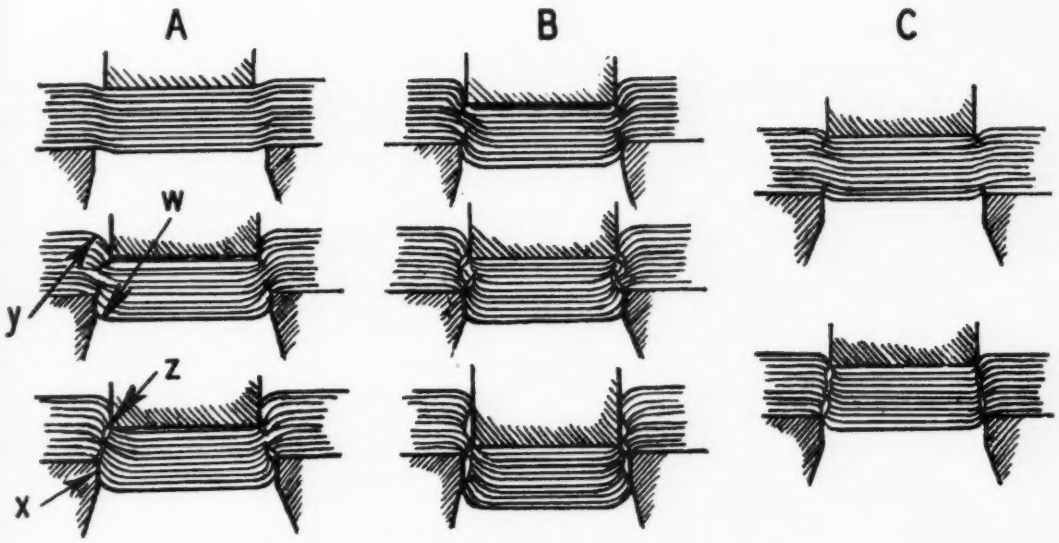


Fig. 1 Three comparative degrees of punch and die clearance, showing the resultant shear and breakage. See text for effects of variation in material hardness.

Pressure Blanking and Piercing With Die Cushions

by D. A. Rogers

Mr. Rogers is president of the Dayton Rogers Manufacturing Company, Minneapolis, Minn.

PIERCED HOLES, AS WELL AS BLANK CONTOURS, can be produced with minimum edge breakage if hydraulic die cushion pressure is exerted properly while these operations are being performed.

On non-ferrous materials and some ferrous materials, we usually use a "rule of thumb" that the clearance between the blanking or piercing punch and the die opening should be about 8% to 10% of the material thickness. This commonly used standard practice tends to increase the punch and die life.

Too often, however, this amount of clearance has the effect of producing what is commonly termed "breakage" in the pierced part or blank contour. This clearance may vary, for reasons of hardness and thickness of material. Also, the punch and die clearance will be different on various non-ferrous materials. Three comparative degrees of clearance are shown in the examples of Figure 1.

Example A (usual clearance) illustrates the results that will be expected from material like cold rolled sheet steel, commercial quality, that is less than 1/4 hard temper; or with a shear strength of about 45,000 psi.

In this case there will be a slight pulldown at "w" of the blanked edge on the die side, and there will be a straight sheared section "x" for about 25% to 30% of the material thickness, again on the die side.

The opposite will occur on piercing as indicated by "y" and "z" on the punch side. The balance of the thickness will have breakage. More pulldown and a greater sheared edge will occur on softer materials.

Example B indicates the results of less than the usual clearance. Increased blanking pressure will be required and double breakage on the blanked edge may occur. Sometimes double breakage on thick parts might be more desirable than 8% to 12% taper.

Example C indicates that on very hard materials, the pull-down is negligible and the sheared edge would possibly amount to only 10% of the stock thickness.

Under ordinary practice, when a shaved edge, either on the pierced hole or the blank contour, is required, secondary operations

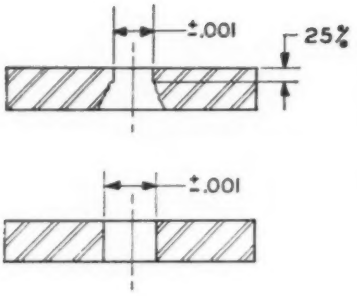


Fig. 2 Normally, rough piercing produces a fairly accurate hole size through about 25% (seen above) of the stock thickness. A gain in hole accuracy and form (seen below) are attained by holding the stock under pressure by a pressure pad.

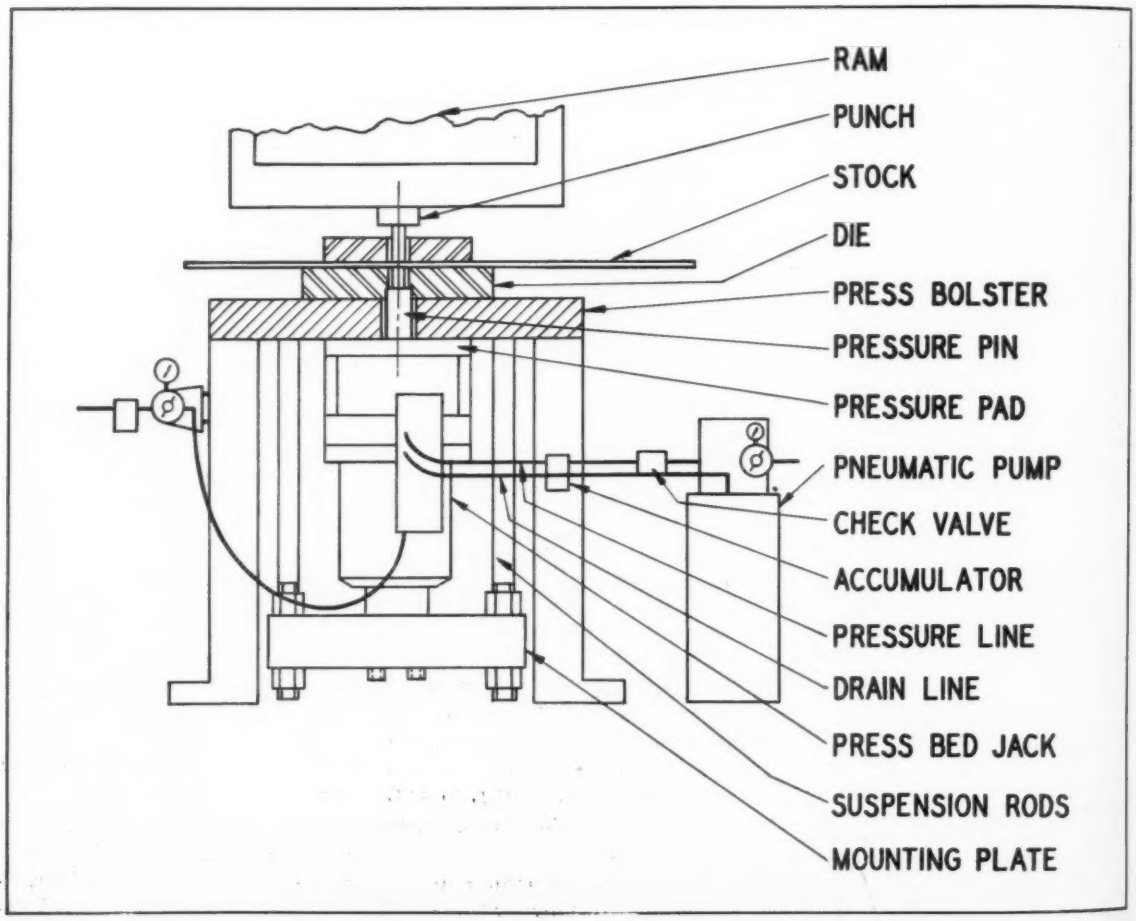
have to be introduced. This presents a problem of removing the shaving scrap as well as the additional cost of the operation and tooling. The result of this shaving operation, which removes a small portion of the material around the hole or contoured edge, is to produce a smooth surface through the entire thickness of the part.

In most cases shaving tools require the introduction of magazine feeding fixtures to get the rough blanks in their position for shaving. Secondary operations such as shaving have to be carefully analyzed, particularly where there are pierced holes and slots, so that the shaving tool and its operation will work on an economical basis.

Normally, a pierced hole in a piece of stock breaks through and only 25% of the stock thickness is a fairly accurate hole, Figure 2. If a finished hole is required through the stock thickness, as indicated at Figure 2, this can be obtained by the introduction of a pressure pin from a hydraulic press bed jack, to keep the pierced slug or contoured blank under pressure, while the stock is also being held under pressure by a pressure pad. Maximum pressure should be introduced at all times on the stripper and stock pressure pad.

By the introduction of a hydraulic press bed jack, Figure 3, required shaving operations can be reduced to a minimum; most blanked and pierced parts can be produced in a most satisfactory manner, eliminating in a number

Fig. 3 By employing this hydraulic press bed jack subsequent shaving operations can be reduced to minimum.



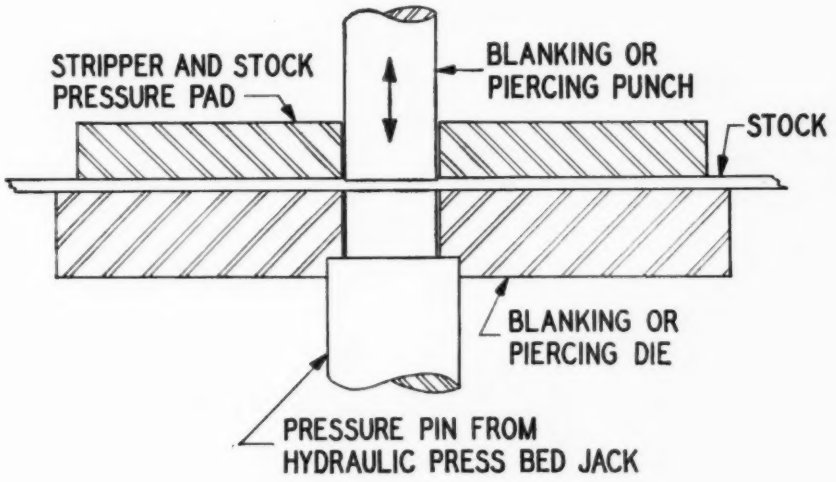

STRIPPER AND STOCK PRESSURE PAD
BLANKING OR PIERCING PUNCH
STOCK
BLANKING OR PIERCING DIE
PRESSURE PIN FROM HYDRAULIC PRESS BED JACK

Fig. 4 Typical arrangement of a die incorporating a pressure pin "powered" by a press bed jack or die cushion.

of cases the secondary operation of shaving or trimming by a die design and construction as shown in Figure 4.

Basically, this is obtained by keeping both the stock and the proposed finished blank under pressure during the blanking and piercing operation. This assures a maximum smooth edge on the contour of the blank as well as the pierced holes. By introducing correct controlled pressure on the pin or pins from the hydraulic jack (keeping the pre-blanked and pierced material under pressure) a smooth semi-shaved edge is assured on the finished product.

It should be understood that a somewhat larger press should be considered in such blanking and piercing operations due to the hydraulic controlled pressure that is introduced by the press bed jack to assure correct blanking and piercing pressure during the work cycle. A good rule of thumb is to double the press capacity that would be ordinarily used on conventional blanking and piercing operations.

Once the blank holding pressure is obtained, by trial and error, the hydraulic jack pressure is an easy matter to record. When the job is reset, all the operator has to do is to set the controlled pressure on the tonnage indicator and the job is ready to run.

Good smooth edges are obtained on all blanking and piercing operations by eliminating as much as possible the punch and die clearance, thus avoiding what is known as breakage or tear of the stock being fabricated.

During the upstroke of the press, to facilitate the ejection of the blanks, the stock strip is raised about ¼" above the die surface, while the lower pressure pins raise the sheared blank out of the die. With the press inclined at about 30°, an air blast blows the finished parts from the working position to a tote box in the rear.

The hydraulic press bed jack can be "hooked on" to the average air line, since a pneumatically operated hydraulic pump provides the hydraulic cylinder pressure required. Press bed jacks are available in 20,28,48 and 66 tons. They can be easily mounted on the bolster plate or the press bed itself, similar to an installation of a pneumatic die cushion.

Extra copies of this article are available while supply lasts. Write Tooling & Production Magazine, 1975 Lee Road, Cleveland 18.

What About CPI?

That's the question asked by several readers unfamiliar with the term "CPI" used in Horace Frommelt's article "Ceramics Can Take It. . . ." (T&P, Sept. '60). It's a British method of expressing feeds and refers to cuts per inch. Thus when the feed is given as 250 CPI it is the same as 0.004"/rev.

Convenient Cam Collector

Taylor Fibre Co. fitted this ingenious cabinet with slide-out vertical separators of pegboard to make its complete laminated plastic cam assortment instantly available to machine operators, right out on the fabricating shop floor. It eliminates the need for trips to the toolroom and sorting out cams tossed into boxes.

An Editor Interprets (TP)

Part III

by William E. Hoffman
Managing Editor

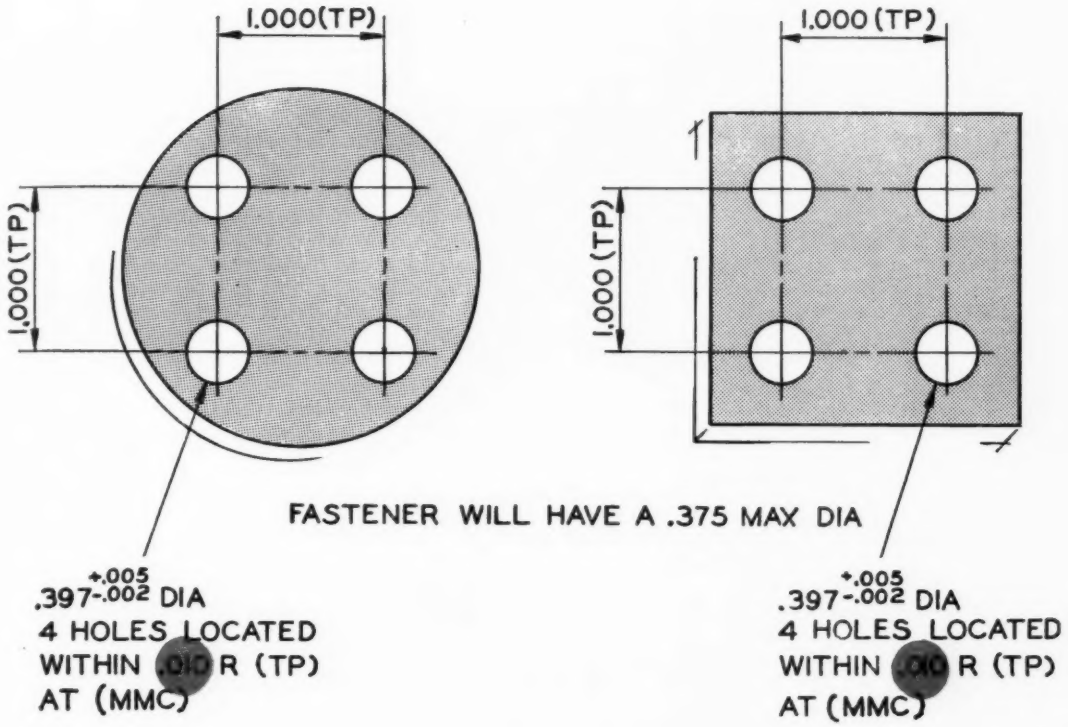
This part of the series deals with "floating" and "fixed fasteners," and how True Position Tolerancing fits into their use.

What TP (True Position) does:
- Allows interchangeability without use of small tolerances
- Provides more area for location of hole center
- Speeds determination of tolerances
- Simplifies tolerancing of complex parts
- Overcomes accumulation of tolerances
- Gives more adequate location
- Interprets tolerances for both production and inspection
- Permits use of easily made gages that simulate mating part
- Reduces scrap caused by other tolerancing methods

Part IV will appear in the January issue of Tooling & Production. Complete set of series will be made available early in 1961.

Mating parts are "floating fasteners" when all holes involved are clearance holes, such as in Fig. 1. Here the holes are specified and located by the TP method—for a very definite advantage.

Most engineers have at some time been faced with the problem of specifying location tolerances. With this method they are a breeze. As you will see it's so simple it may scare you.



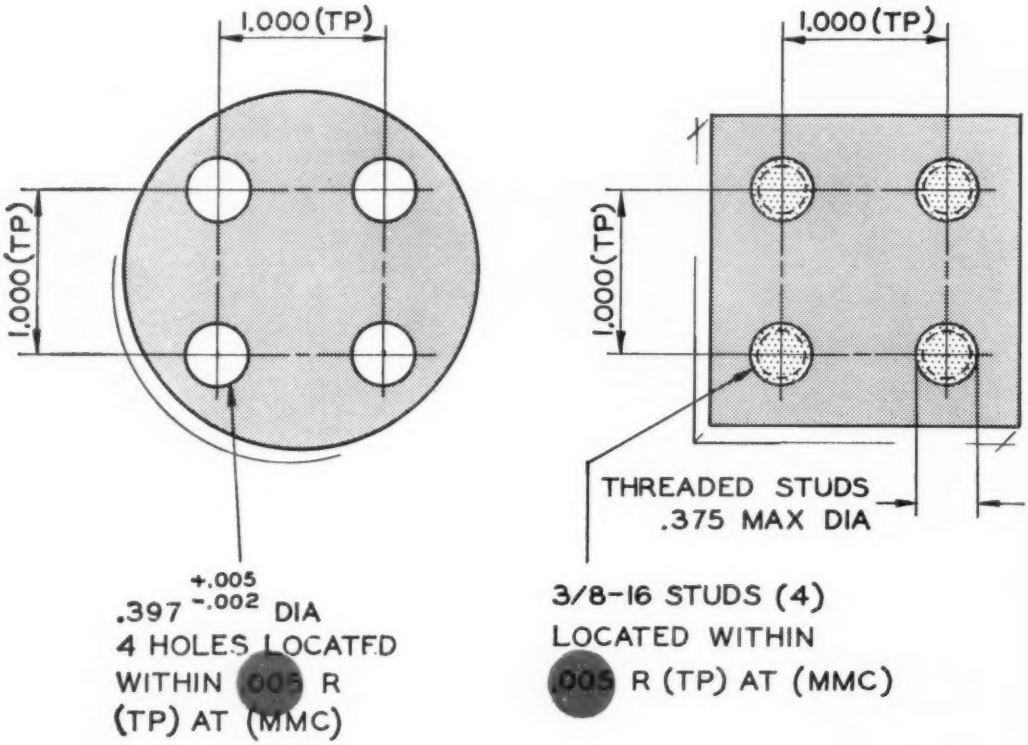
TO ESTABLISH (TP) RADIUS IN SPECS NOTES

MMC OF HOLE .395
MMC OF FASTENER −.375
DIVIDE BY 2 | .020 | .010
(TP) R = .010

Fig. 1 So you have easily established hole location and size, after having decided on a 0.375 diameter fastener. QUESTION: What do you need as a (TP) radius to assure a "mate" condition? ANSWER: Subtract the MMC size of the fastener from the MMC size of the hole, and divide by two.

MMC stands for maximum material condition. For a male part it is the largest size and for a female part it is the smallest size. Remember (TP) refers to the center of a hole or fastener.

Mating parts are "fixed fasteners" when one has clearance holes and the other has tapped holes, or threaded studs, such as in Fig. 2. Holes and studs are specified here by the TP method for the same advantage of easy specification of locational tolerances.



TO ESTABLISH (TP) RADIUS IN SPECS NOTES

MMC OF HOLE .395
MMC OF FASTENER -.375
DIVIDE BY 4 | .020 | .005
(TP) R = .005

Fig. 2 Here, you have established hole and stud location and then stud size. QUESTION: What do you need as a (TP) radius to assure that the parts will go together? ANSWER: Subtract the MMC size of the fastener from the MMC size of the hole, and divide by four.

Here are localized areas of the mated parts in Fig. 1 and Fig. 2 showing by tolerance areas the condition that exists.

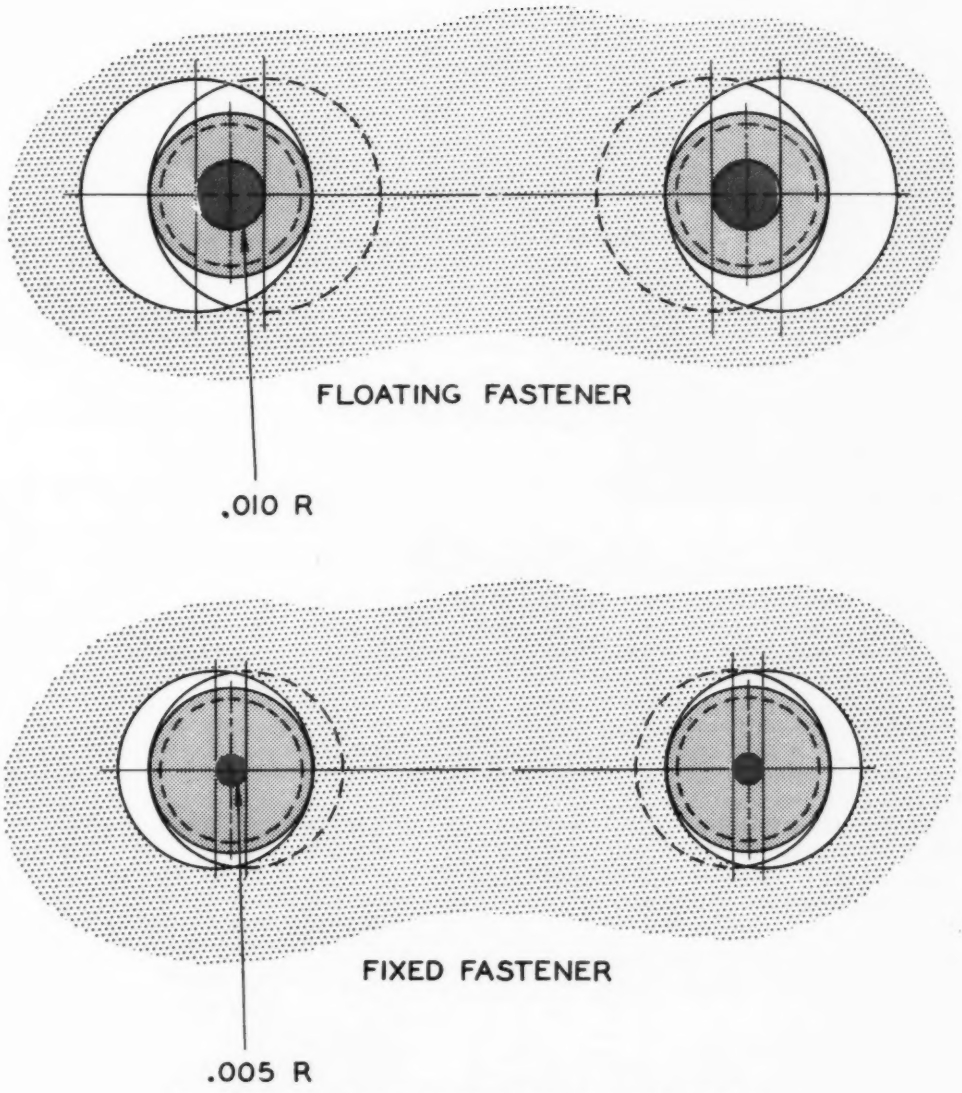


Fig. 3 In both cases here mating takes place; if it did not, hole lines would pass over tolerance zones. In each case, "floating fasteners" above and "fixed fasteners" below, only two holes of each condition are shown.

Welder Repairs Dies On The Job

Fig. 1 Resistance welding probe is held in upright position to fuse steel pellet into base metal cavity.

A small, gun-type welding device allows correction of defects in tools, dies, and molds without disturbing the machine setup. The Dot Welder, made by Mid-States Welder Mfg. Co., Chicago, produces a short pulse of high density current which fuses a steel pellet into the base metal. It completely fills the void and doesn't create any additional pits or cracks.

The welding method has proved a timesaver to many companies because repairs can be made to the die without removing it from the machine. Additional time-savings are realized because the weld is restricted to the immediate area of the defect and eliminates the need for preheating and postheating of the base metal. Grinding of the weld is greatly reduced and refinishing of the base metal surface is minimized.

In operation, the section to be welded is first enlarged with a center punch, drill, or carbide cutter. The cavity is cleaned and the pellet is placed in the cavity. Pellets are handled with a tweezer to avoid picking up of oil or other foreign particles that can cause impurities in the weld.

The grounding clamp of the welding unit is then placed on the work near the weld, heat and time dials are set, and the hand-held probe is brought into position on top of the pellet without contacting the base metal. When the switch is pressed the pellet is automatically resistance-heated. Upon reaching the fusion temperature, the pellet flattens and fills the cavity, allowing the probe to contact the base metal. The finished weld is then filed or ground and finished so that it is almost impossible to detect the defect.

end

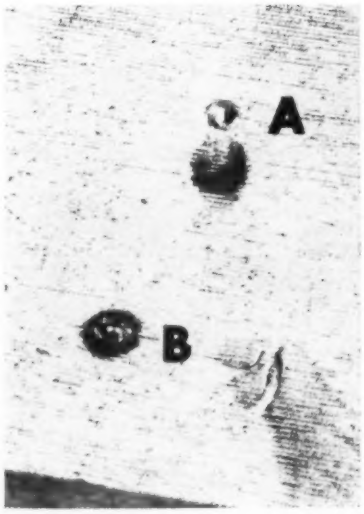


Fig. 2 Die defect enlarged with punch (A) is ready to be welded. Steel pellet has been inserted into another cavity (B) and fusion welded.

Fig. 3 Original appearance of die is restored after appropriate finishing operation. Here a 600 grit stick is used on die.

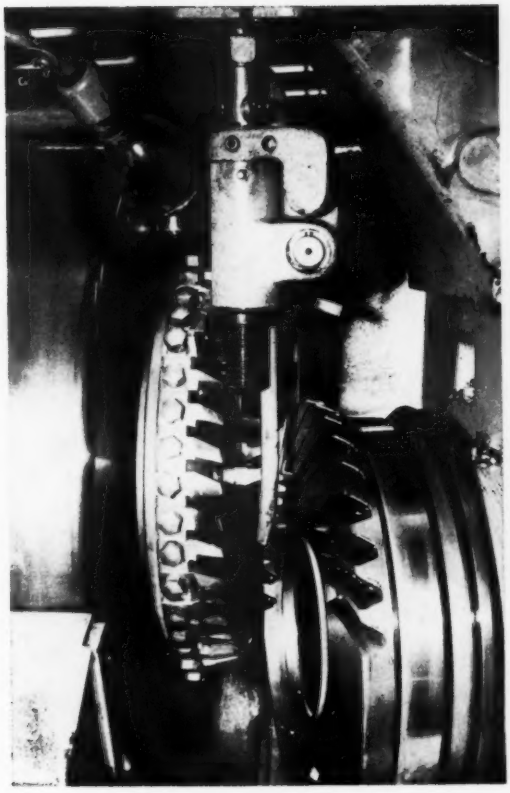


Fig. 1 Ultrasonic treatment of Gleason blades used for rough cutting teeth on this 18" dia ring gear upped tool life from 18 pcs/grind to 50 pcs/grind.

A Sound Approach To Tool Costs

by Charles Weiner
Assistant Editor

THE STORY OF TOOL LIFE is told in terms of pieces/grind. At a nationally known company the story is sounding better all the time. Production men at that manufacturing plant report that on one job they've increased tool life up to eight times and on other jobs have saved $3800/yr in tool costs. The results suggest that they have a sound approach to tool life — and they do. The company uses tools treated by ultrasonics to boost pieces/grind.

Tools purchased in the heat treated condition are sent out for the special treatment before they are used. The ultrasonic treatment, known as Protreat, is done by Productive Tool Service, Inc., Bay Village, Ohio. Treated tools are then finish ground and put into operation. The tool control chief reports that the specially treated tools cut more metal before the first grind than do tools used "as is" from the tool manufacturer. The amount of improvement increases with each successive regrind until a peak number of pieces/grind is reached and maintained after the fifth regrind.

Fig. 2 Spotfacing to provide clearance around the kingpin hole of this steering knuckle involves intermittent cutting. Poor tool life and excessive breakage were eliminated on this job after the counterbore was redesigned and ultrasonically treated. Net savings here were $3,800 after one year.

Just what happens to the tool during the Protreat process is a mystery. Several steel companies and leading universities have tested the tools, and as yet have not been able to pinpoint any metallurgical changes that account for the great increase in life. Microscopic examination of treated tools reveals a very fine grain structure as compared to untreated material. This suggests that some molecular change, as yet undefined, takes

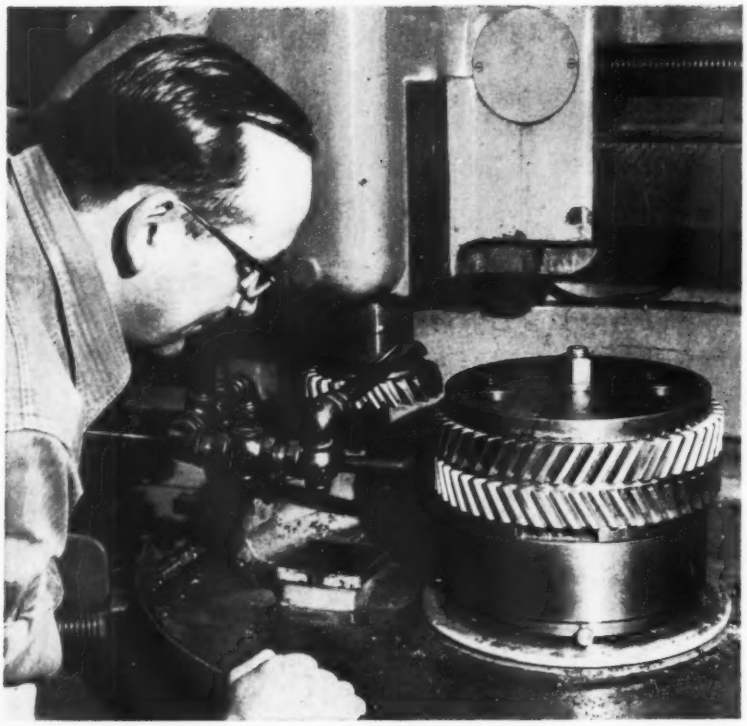


Fig. 3 Life of cutters was boosted from 1 pc/grind to 8 pcs/grind on this herringbone gear job. Fifty-five teeth are cut in the 3½" face of the 14" dia gear.

place in the metal.

Mike Kovac, president of Productive Tool Service, admits that he can't explain how the treatment affects the tool. Details of the process are a closely-guarded secret, but Mr. Kovac does say that ultrasonic energy permeates the entire tool. The treatment produces a small, hair-like burr on the cutting edge which must be ground off before the tool is used.

The progressive increase in tool life without any additional treatment prompted Mr. Kovac to grind off stock, of a treated but unused tool, to a depth equivalent to four regrinds. His attempt to reach peak tool life before the tool was put into service was unsuccessful. Some type of in-service work hardening is suggested as a possible explanation for this behavior.

Users of the process make sure that tools sent out for ultrasonic treatment are at high hardness levels. Although the process does not lower or raise the hardness (no heat is used), best results are obtained on tools hardened and drawn to above R_c63. The treatment doesn't improve a tool that is too soft.

Savings on Gear Job

On one application, savings on tool costs really have mounted. A Gleason gear cutter is used to rough cut teeth on an 18" dia rear axle ring gear (Fig. 1). The gear is made from an SAE 8640 forging at a hardness of R_c31. Gleason blades purchased for the job were Protreated before they were used and average tool life increased from 18 gears/grind with untreated blades to 50 gears/grind with the treated blades. Net savings, after a year on the job, were $2700. Tool men were so pleased with results that they now specify the ultrasonic treatment for all Gleason blades used by the company.

Counterbore Problem Solved

Another job involves spotfacing the upper and lower bosses on a steering knuckle for clearance around the kingpin hole. The shank of the tool fits through the upper kingpin hole, and the counterbore is fed down into the work to a depth of 3½" (Fig. 2). Intermittent cutting of the SAE 8640 forging (R_c31) took its toll in tool life. With the standard 3½" M-2 steel counterbores formerly employed, the company used 42 cutters/yr. Tool life was 10 pieces/grind and there was considerable breakage at the tool shank.

Productive Tool Service supplied the same size counterbore but made of T-15 steel. It was heat treated to R_c67-68 and then ultrasonically treated. The shank was redesigned to eliminate sharp angles on the keyway. Productive did this by cutting the keyway with an end mill instead of a Woodruff cutter.

The new tools produced 30 pieces/grind, breakage decreased about 80%, and cutter use was reduced to 14/yr. Despite the $7 difference in initial tool cost, the savings on the job totaled $3800 at the end of a year.

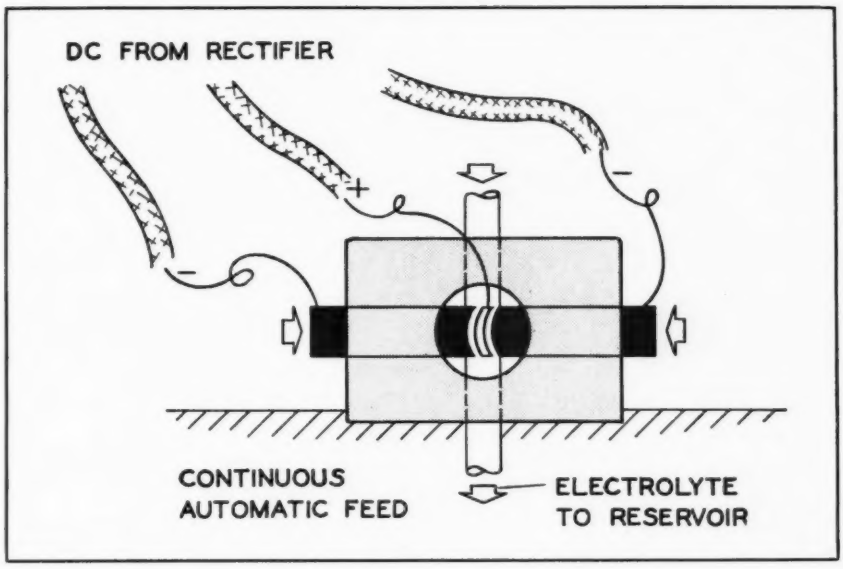
Gear Cutter Life Boosted

An eight times increase in tool life was obtained on a gear job. Teeth are cut on herringbone and helical rear axle reduction gears on a 36" Fellows gear shaper (Fig. 3). The SAE 8620 gears are at a hardness of R_c45. Fifty-five teeth are cut in the 3½" face of the 14" dia gear. The cutters required grinding after only *one* gear. When given the ultrasonic treatment before being put into service, they cut teeth on *eight* gears before grinding was necessary.

Tool costs have also been reduced on hobs used for crankshaft and camshaft timing gears. On these jobs, life increased by approximately 80% for a net yearly savings of $2100. Present plans call for ultrasonic treatment of all hobs used by the company.

Savings on treated drills and milling cutters round out the story of tool longevity. What the sound waves do to the tools is still a mystery — but satisfied production men aren't losing any sleep over it

Breakthrough In



Electrochemical Machining

ABOUT 10 YEARS AGO, Dr. Charles L. Faust, chief of Battelle Memorial Institute's electrochemical engineering division, began to talk about a new way to machine metals electrochemically.

About 2½ years ago, officials at Steel Improvement and Forge Co., Cleveland, began to listen to him intently, found an application to thoroughly test his contentions, and today the company has produced more than 15,000 jet engine turbine blades by "electroshaping." The firm supplies such parts to Pratt & Whitney, General Electric, and Westinghouse.

Steel Improvement supported the Battelle research work, gaining exclusive rights to the process.

Production Proved

The electrolytic process has machined the rough forged turbine blades to 0.003″ tolerances in 5 to 10 min. It formerly took 1 to 2 hrs of grinding to produce the same parts. Besides shaping, other electrochemical setups can be used to sink die cavities in 50 min that previously took 7 to 10 hrs of machining. Steel Improvement is also using the electrochemical method in experimental and limited production tungsten cutoff and trepanning work. Company officials look for it to eventually replace conventional machining where the ultra-strength alloys are used, or where intricate configurations are specified.

Here's how it's applied to produce turbine blades at Steel Improvement. Direct electrical current, converted by a simple rectifier, passes from the workpiece to two electrodes through a rapidly-moving electrolyte, removing electrons from the workpiece, and converting the surface atoms into positively charged ions that dissolve into the electrolyte.

According to Dr. Faust, both the current's intensity and the electrolyte's flow are critical considerations in the successful use of electroshaping. The re-circulating electrolyte rushes through the gap between workpiece (anode) and electrodes (cathode) at between 20 and 100 mph. Current requirements range up to 1500 amps/sq in of workpiece at 3 to 12V to achieve a penetration rate of 0.050 to 0.100 ipm. For most operations, a 100 to 500 amp current is sufficient. Electrodes of any conductive metal can be used.

In the turbine blade application, machines built especially for the process by Custom Tool & Mfg. Co., Minneapolis, a Steel Improvement subsidiary, are used. A special fixture clamps the turbine blade in a cube-shaped enclosure. The two electrodes bear a mirror image of each of the turbine blade's two faces, and are moved in closer to the blade by hydraulic feed, at about 0.007 ipm each, as current is applied and electrolyte is forced through the gap from above the fixture.

Advantages of Electroshaping

There is no contact between workpiece and electrodes, so the

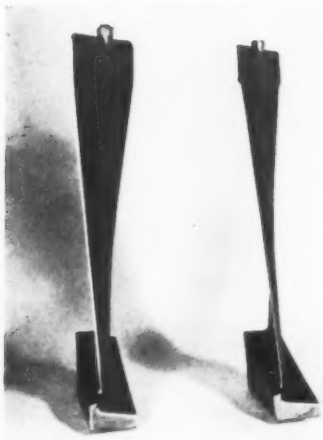


Fig. 1 Waspalloy chord turbine blade (11½" x 4") at right has been electroshaped, while blade at left, with thicker leading edge, is in the "as forged" condition.

electrodes can be used "ad infinitum" with no appreciable wear. The lack of tool-workpiece contact also means that the process can be used to give thin gauge metals the "kid gloves" treatment they require.

Electroshaping produces burr-free finishes that need no secondary operations. It is also quieter than conventional machining, a significant consideration in cutoff work, for example.

One operator can often handle a number of electroshaping stations on a basic machine. He needs only load the fixture into the plastic-fabricated work chamber, initiate the current and electrolyte flow, and start the automatic hydraulic feed of the electrodes.

The rate of stock removal is directly proportional to the current's intensity. Dr. Faust says that smoother finishes result from boosting the current. This distinguishes the process from electrical discharge machining, in which a boost in current intensity erodes metal faster, but disrupts the surface unevenly, leaving a gouged effect.

Simply stepping up the current is no panacea, however, because the electrolyte must still be able to carry away the dissolved metal as fast as it's worn off, and the electrode feed rate must be closely controlled to complement both current intensity and electrolyte flow.

The reason it took so long for the electroshaping process to "catch on," Dr. Faust explains, is that he wanted to find a manufacturer who was truly interested in the process, and who would develop machinery uniquely suited for it, rather than adapt the process to existing machine tools.

Steel Improvement President Charles H. Smith, Jr., says it remains to be settled whether the electroshape machines will be leased to a customer, or sold outright, with a license to use with or without a technical service contract. The company has also developed machines for cutoff and trepanning work.

Other Applications Foreseen

Steel Improvement officials are quick to emphasize that the electroshaping of jet engine turbine blades is merely the first production application they've authorized. They foresee the machines they've developed serving as springboards for applying electroshaping to a wide range of other work.

In cutoff work, the current effective production rate is somewhere around 44 cuts/day for an industrious operator, says Dr. Faust. He looks for the Steel Improvement-Battelle electrochemical method to result in a 200 cut/day rate. Steel Improvement still uses a conventional abrasive wheel in this cutoff work, but that's only to concentrate the electrolyte where it will do the most good. The wheel is bathed, and its whirling action forces a finely concentrated stream of electrolyte against the workpiece. This concentration of the cutting action means a narrower kerf, and less material waste than in conventional cutoff work. As there's still no contact between wheel and work, the cutting wheel is reusable repeatedly.

In trepanning, Steel Improvement has sunk a hole in sections of tungsten about 6" thick, and has salvaged the hole center. This operation took them about 4½ hrs.

As electroshaping of jet engine components grows in volume at the Cleveland company, research in the process continues at Battelle. Dr. Faust's team hopes to be able to harness the experimental work done in electrochemical turning, internal grinding and helical grooving, milling, deep hole drilling, multiple hole drilling and die sinking into competitive production for Steel Improvement.

Curran

Fig. 2 Operator loads the blade-holding fixture into the electroshaping machine's work chamber. Tubing at top of chamber directs the electrolyte flow.

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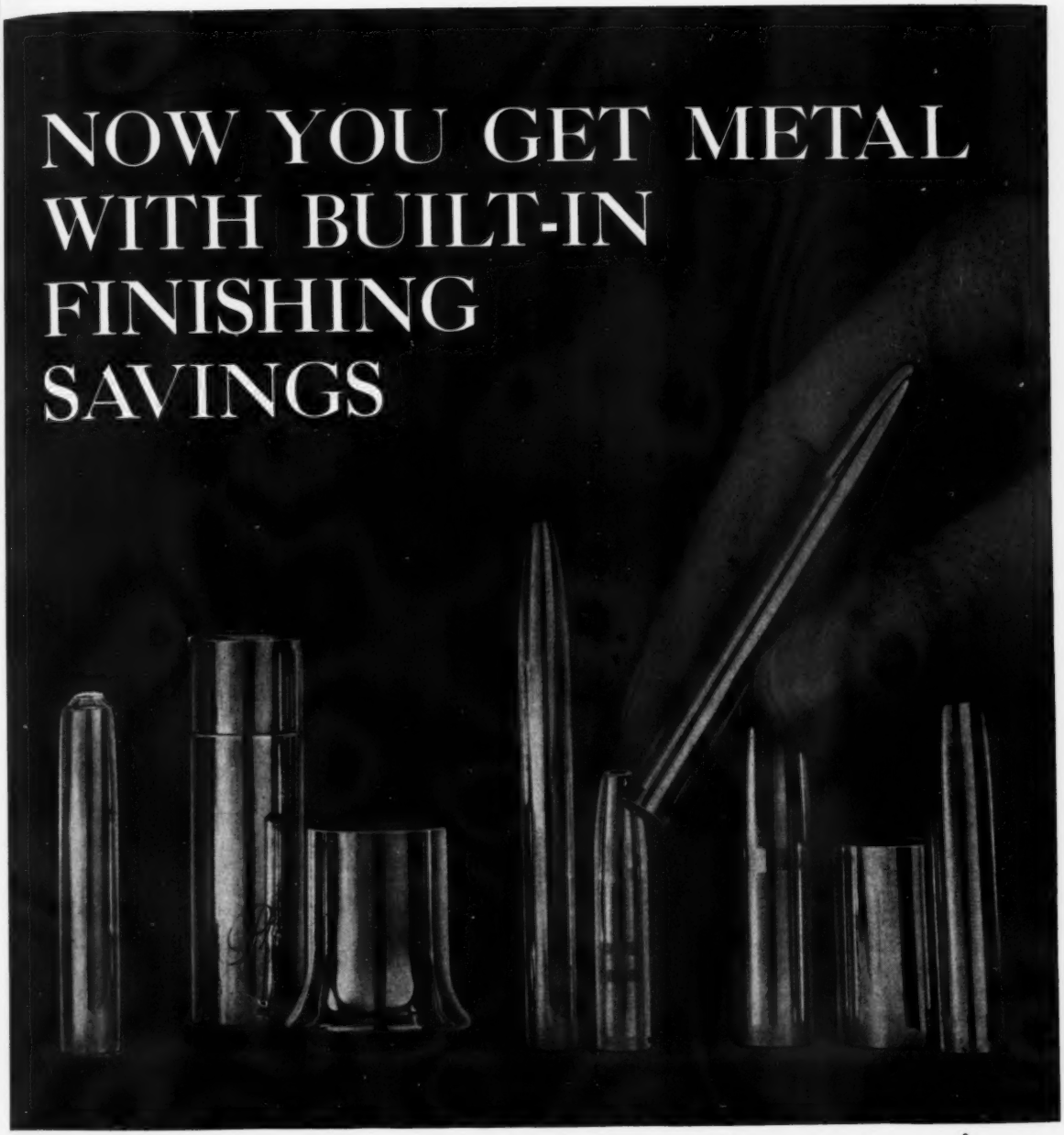

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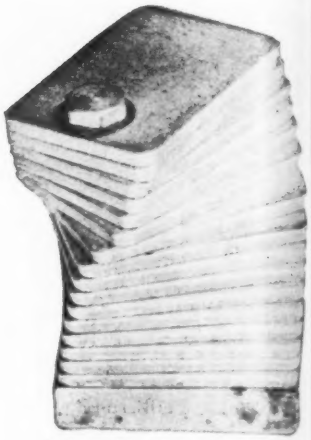

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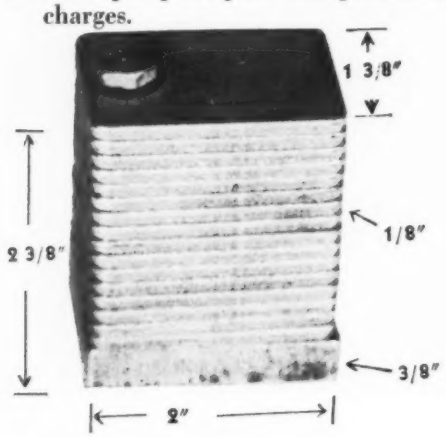

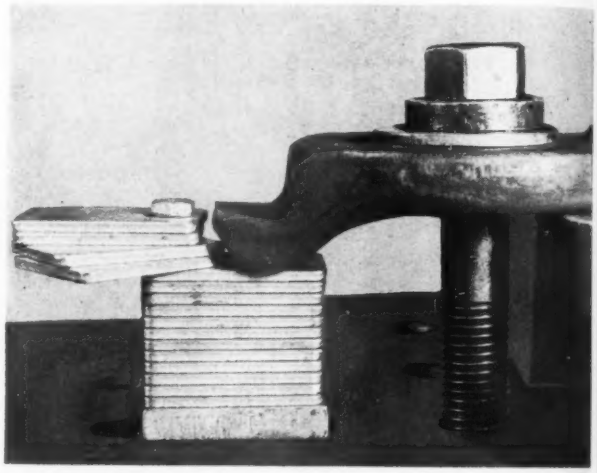

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Specifics On Hydraulic Filtering

Can pressure in a hydraulic filter carry unwanted dirt on through? When do you change filters? How do you choose a filter?

PROPER FILTRATION is a two step operation. First, is to withhold the particles of metal, carbon, fiber, dirt, etc. which cause wear and mechanism failure. Second,

How To Choose

In classifying filter mediums the size of the smallest particle filtered out (in thousandths of an inch) at 98% efficiency is the rating. This rating can be a U.S. Sieve (mesh) number or a micron size (a micron is a unit of measure equalling one millionth of a meter, or 0.00004").

It may be convenient to remember that there are approximately 25 microns to a thousandth of an inch and that popular filter ratings are from 10 microns (0.0004") to 238 microns (0.009").

The choice of a filter will usually be based on past experience, but if experience is not available a filter should be chosen whose degree of filtration is at least capable of filtering out particles as small, or smaller, than clearances in the equipment to be protected. For example, valves having clearances of 0.001" to 0.002" require a filter that would be rated at 25 microns, or less. Such fine filtration would also be required to handle grinding dust in coolant systems. Generally, it has been found that a 149 micron filter (100 mesh) is adequate for wide industrial use. But caution is suggested in the use of generalities.

You can't always choose a filter perfectly matched to a system but you can more closely approach optimum by using a Flow Curve Chart. The chart shown here is typical of those available for various filters. Each Flow Curve Chart would differ with the housing area and the filtering element used in that housing.

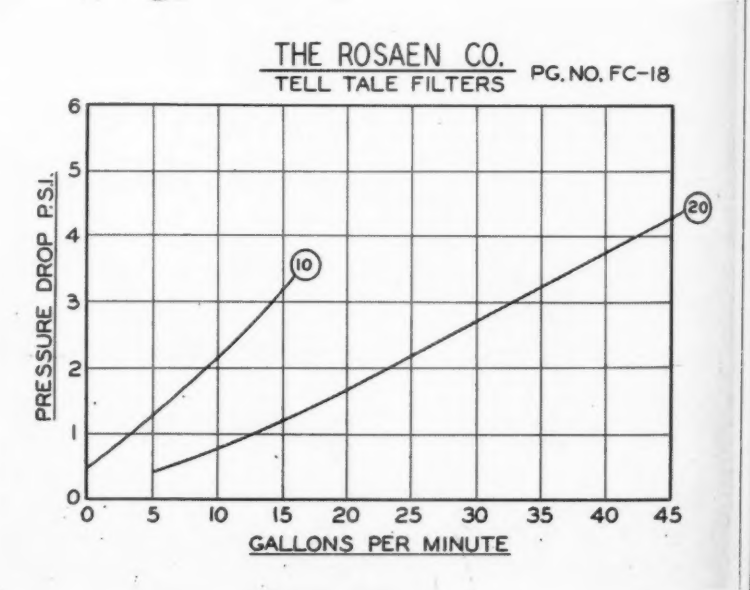
The gpm, or flow rate needed for your application, is plotted against the allowable pressure-drop for safety of a specific pump. Each curve is for the micron rating of the elements you might use in that housing.

Let's say your pump could stand nothing more than a 3 psi pressure-drop before trouble, and your flow had to be about 20 gpm. If you need a filtration of 20 microns you specify this in a housing area that will give the proper gpm at a low enough pressure-drop for protection.

Knowing the pressure-drop, as established by the Flow Curve Chart, is the big advantage of this aid. For instance, in the Chart shown, a 20 micron element is plotted as is a 10 micron element; if the 20 micron element, at say 23 gpm is your answer — because it allows a safe pressure-drop of about 2 psi — you can see where you would be with a 10 micron element. At 23 gpm the 10 micron element would damage the pump with a pressure-drop of about 5 psi.

As a further comparison, the 20 micron element would require cleaning at a value of 33 gpm whereas the 10 micron element would require cleaning at a value of about 14 gpm — twice the frequency. Of course this comparison means nothing unless you assume that some over zealous engineer — just to be extra safe — specifies the 10 micron element when the 20 micron element would have done the job better.

Actually pump damage is not as prevalent as damage to working parts from abrasive particles being by-passed, and yet we say a by-pass is a must. The whole problem is cleared up by a provision for knowing when the filter needs cleaning — ahead of time.



these contaminates must be removed from the filter, this is just as important.

Proper filter maintenance is as much to eliminate unnecessary cleaning of filters as it is to clean them just before they become too dirty. Certain filters indicate when cleaning is needed, as determined by the amount of pressure-drop created by the dirt. With these you choose the pressure drop at which the filter is deemed "dirty" and clean accordingly.

You can't base filter maintenance on the calendar; the rate of contamination is rarely constant and to clean before dirty is a prohibitive expense. Filters having by-pass valves to prevent pump cavitation (and every filter should have this feature), plus indicators to show when a by-pass is in action, only tell that the filter needed cleaning yesterday. Today you are pumping unfiltered fluid. Also, pressure indicators to show that pressure-drop is changing are notoriously undependable and require interpretation.

Designers tend to specify oversize filters because of the difficulty in determining when they will become inoperative. In this way they erroneously feel they are creating an advantage by increasing the cleaning time lapse. Actually the user feels safer and lets it go — sometimes altogether.

A way to eliminate this business of trying to predict how long before by-passing begins has long been needed. It is now available and has been made easy, but until recently filters were not available with features predicting their condition. Consequently maintenance was often ignored — and very costly.

Basic Requirements

A filter medium with openings smaller than the particle size to be removed is only part of the requirements of a filter. Excessive pressure-drop can cause oversize particles to be extruded through the openings.

Dirt-clogged filters present a cavitation threat to pump life. For this reason no filter should be used without a built-in by-pass valve. Serious damage can result and since pumps vary in the amount of pressure-drop they can safely tolerate, a control spring should be chosen to match the pump's requirements.

Filters are rated in gpm flow based on a specific fluid viscosity for a specific degree of filtration. Since their capacity depends on the viscosity of the fluid and the filtering medium, it is reasonable to approximate that the pressure-drop (or differential) for a given flow rate is proportional to the viscosity of the fluid.

Difference between pressure existing on the outside and the inside of the filter medium is the differential pressure, and increases as the filter medium becomes dirty since more pressure (psi) is required to pass the fluid through. The danger is that oversize particles will be forced through. So a filter unit should be carefully designed to provide adequate passage without impingement against the dirt clogged filtering surface. Full flow is best, having a when-to-clean indicator.

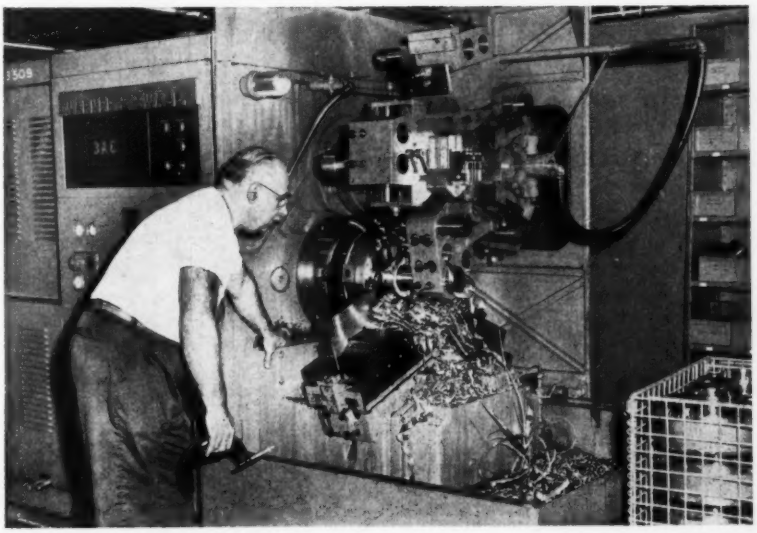
Extra copies of this article are available while supply lasts. Write Tooling & Production Magazine, 1975 Lee Road, Cleveland 18.

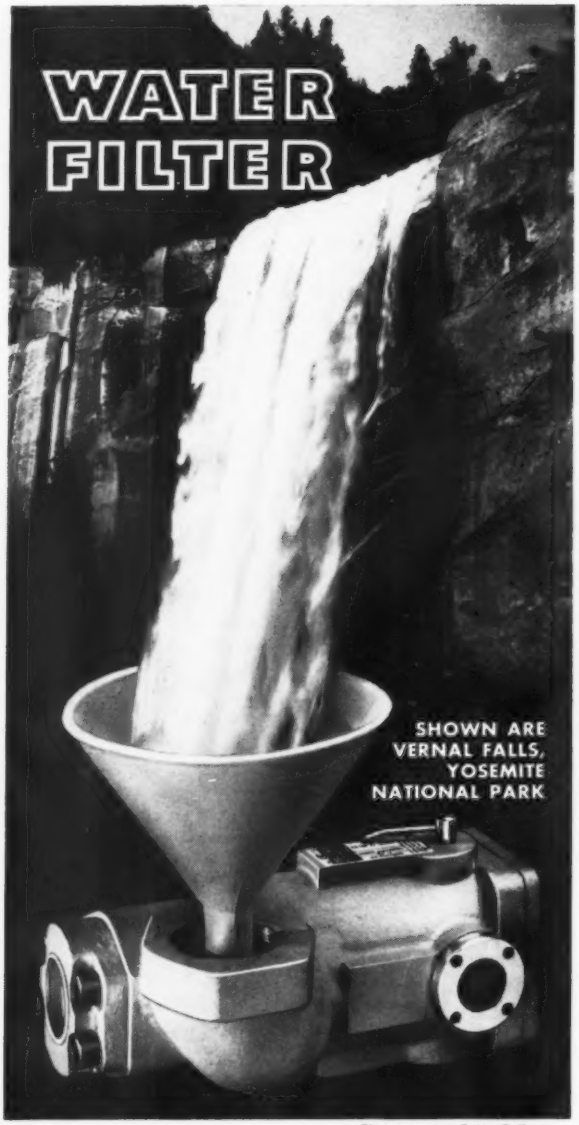
These Chucking Machines Are Hungry

Two automatic chucking machines are making hogs of themselves for Westinghouse Electric Corp.'s Trafford, Pa., facility. They're working on 14″ dia bronze castings, which weigh 103 lbs before machining, and reducing them to 44-lb bottom grids for heavy industrial circuit breakers.

The heavy pre-machining weight is required by the foundry to eliminate porosity. In the first chucking, 15 standard carbide cutters hog off 37 lbs. The bore, interrupted by cast openings, is enlarged from 3½″ to 5⅛″ in four passes, and held to a 0.003″ tolerance. A facing operation, also an interrupted cut, removes another ¼″ to ⅜″ of metal.

In the second operation, the part is turned end-for-end, and six carbide cutters chew off another 22 lbs. A trepanned groove in the face is held to a total tolerance of 0.002″ on both diameter and depth. All this machining is done on two Warner & Swasey 3-AC single spindle automatic chucking machines. Lot quantities range from 24 to 300 pieces. Producing these parts formerly called for time-consuming hand turret lathe and boring mill work. The 3-AC's have also reduced floor space needed for making the grids.





Photos courtesy Ewing Galloway

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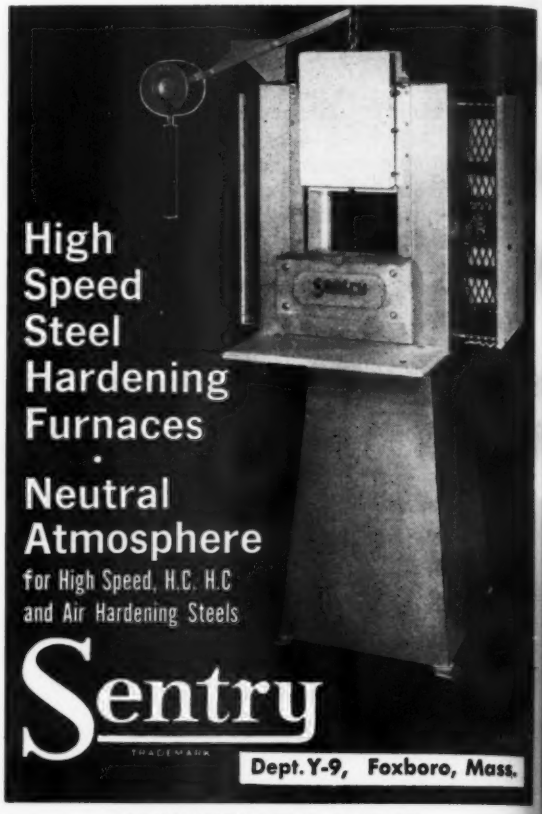

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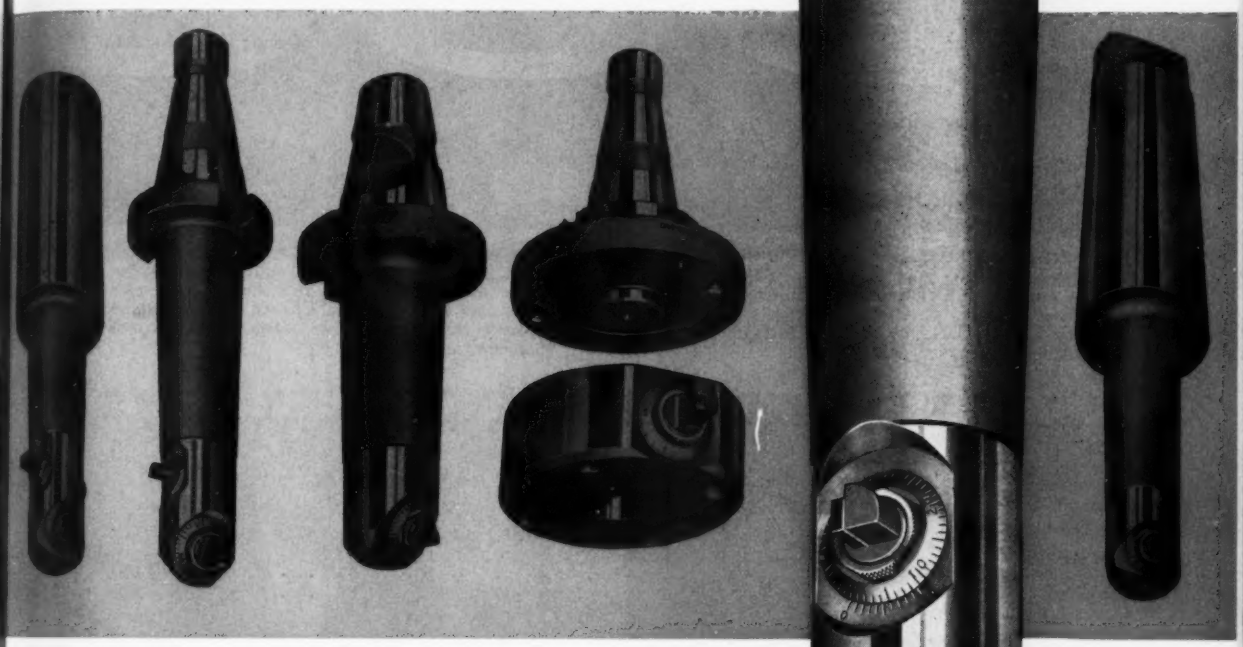

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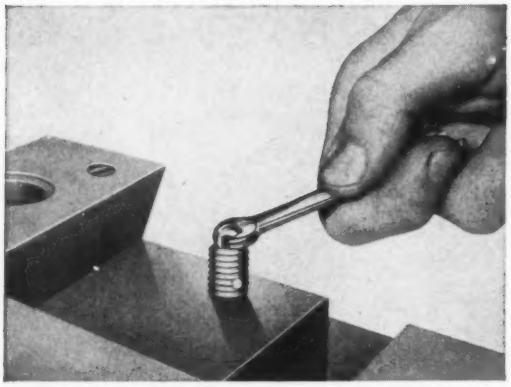
CIRCLE INFORM-A-GRAM KEY NO. 55

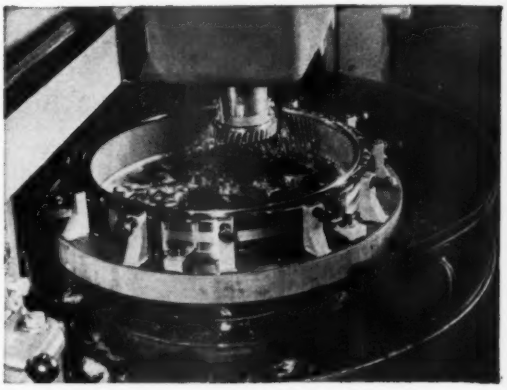
Practical Tooling Tips

No. 4 of a series

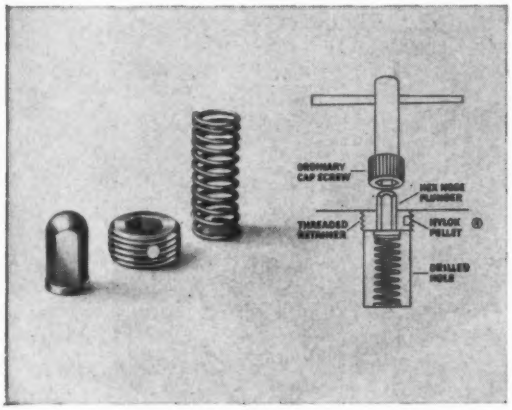
New uses are being found every day for Vlier Tooling Accessories. Perhaps the applications shown below will suggest ways you can profit by replacing costly, custom devices in jigs, dies and fixtures with precision, off-the-shelf Vlier products.



HEX NOSE SPEEDS INSTALLATION OF SPRING PLUNGERS—Vlier Hexnose Spring Plungers are easily installed with a simple end wrench. Eliminates hunting for special wrenches. Made to same exacting tolerances as Vlier Standard Spring Plungers. Available in many end pressures, diameters and lengths.



THIN-WALLED RING GEAR HELD SECURELY in fixture without distortion with 12 Vlier Torque Thumb Screws. Once pre-set end pressure is reached, knurled head spins freely, preventing overtightening. Checknut prevents backing off under vibration. Available in four types; various screw diameters and lengths.



NEW PLUNGER ASSEMBLY PREVENTS DAMAGE TO DIE STOPS—Plunger actuates automatic stop perfectly. Quickly installed, never needs adjustment. Hex nose mates with standard hex head bolts for easy insertion. Nylok® nylon pellet prevents threaded retainer from working loose. 6 sizes from ¼" to 1" diameter. Various end pressures.

FREE IDEA BOOKLET—Illustrations in this 16-page booklet show how others have profited from the use of Vlier Tooling Accessories. Shows both the usual and unusual applications. May suggest ways *you* can save. Write for your copy today.

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CIRCLE INFORM-A-GRAM KEY NO. 56

From the Cover:

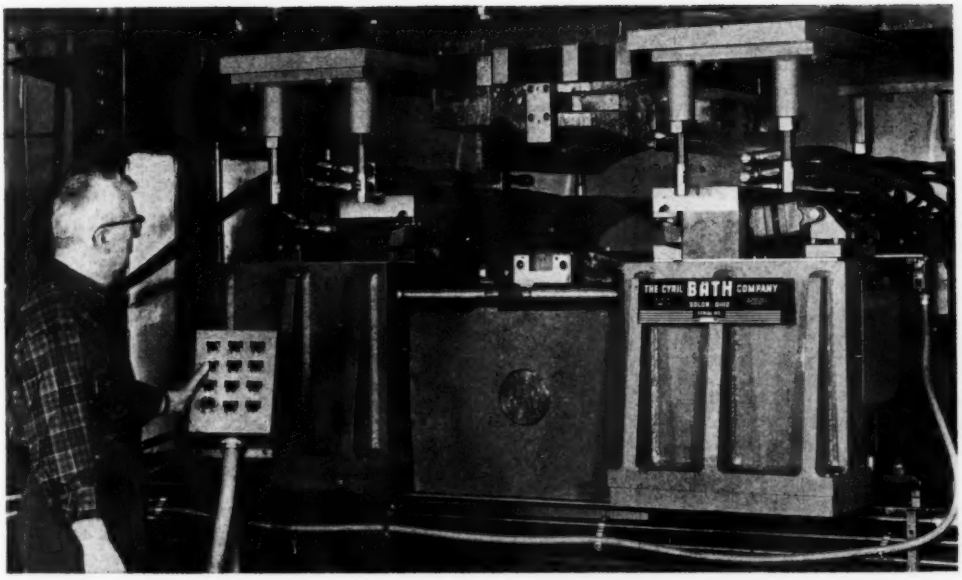


Fig. 1 The formed part is leaving the inverted punch as the press opens. As ram returns, gripper jaws return. They are supported on rods from die cushion which can be eliminated in favor of springs. Although the cycle in this picture is started by the operator, a limit switch can be arranged to be triggered by the part, fed either manually or automatically.

New Pressworking Economies . . . Thanks To Tension Control!

Two individually successful processes are wed for a revolutionary cost savings to stampers.

IT'S BASICALLY SIMPLE: With this press *adaption,* you stretch the metal and then draw it.

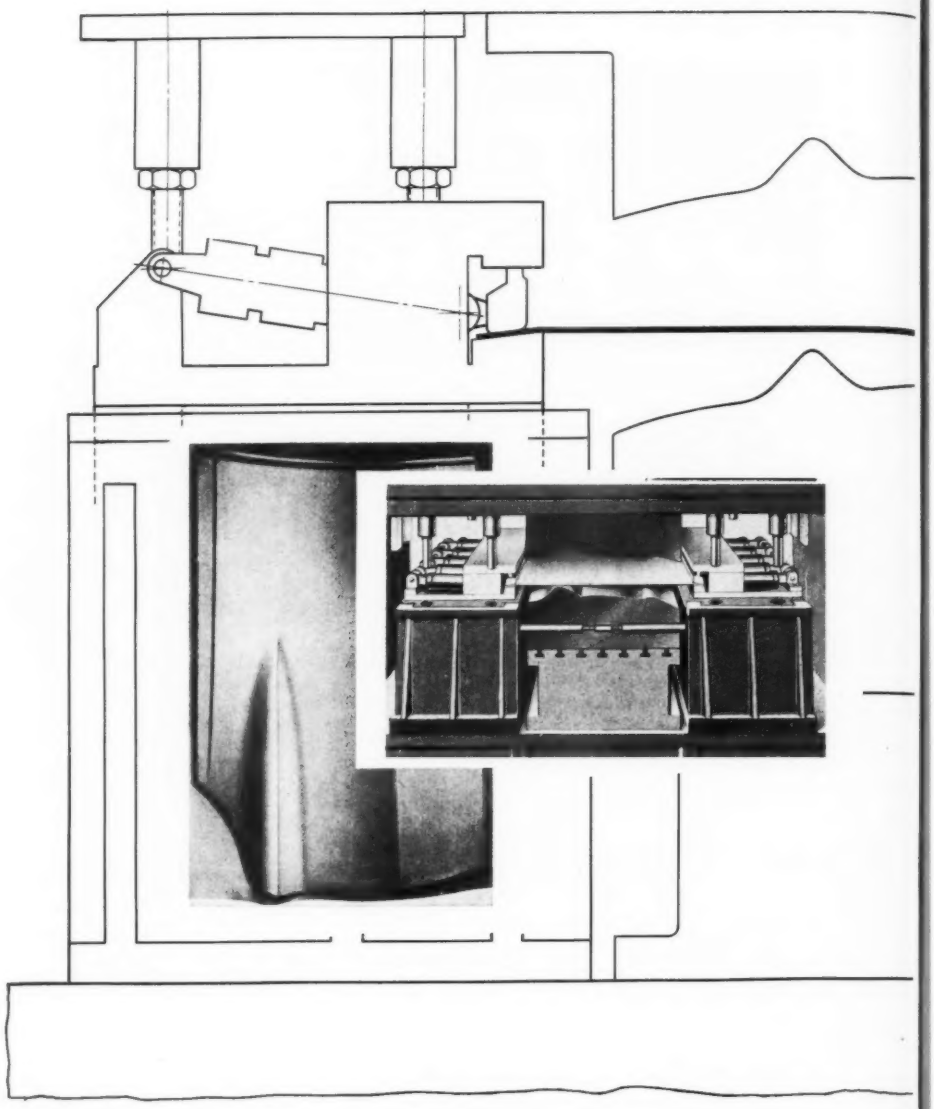
Due to the action you eliminate loose metal in the centers of drum-like panels and effect a tremendous stock savings. No special preparation of stock is needed, and binder stock is only required on two sides.

A powerful toggle press is not needed since a "straight side" with far less "oomph" can do the same work. What once took a 1000-ton press can now be done with a 100-ton press and die cushions can be eliminated.

Ordinarily, where it would take eight hrs for a more complex die change-over, dies used with this equipment will take only about 45 min to set up. The simplicity of the dies to be used makes the combination a tremendous asset for prototype work too. Heretofore complicated dies were often unreasonable in cost and due to this often not used. Instead prototype panels have been laboriously bumped out on a bumper hammer taking hours and hours.

Probably the greatest savings is due to the elimination of trial and error hits and die rework in striving for springback control. By the same token it's not necessary to "spot in" the female, and adjusting pressures on sheet holders is done away with since all this extra paraphernalia is eliminated.

There is, however, the need for setting the pressure on the gripper jaws, but this is easy. Pressure needs are set and maintained re-



gardless of stresses involved in "wrapping" the punch. After setting the stretch pressure, from yield empiricals and gage, the tonnage is held constant by pressure-relief and build-up which allows the jaws to float.

Major Concept Change

The intent of The Cyril Bath Co., Solon, Ohio, known for radial drawing and stretch forming machinery, was to design for the product-result they have accomplished; further, their goal was to have the equipment fit into existing presses without press modification. This is a complete package that goes in and out of a press like a die.

Where the old arch type forming failed, this is successful. With arch-forming, metal was clamped and pushed with a punch. No detail was possible because of the lack of a female die. Even with a female die they would not have been able to control certain wrinkling and stretch-strain marking common to stamping.

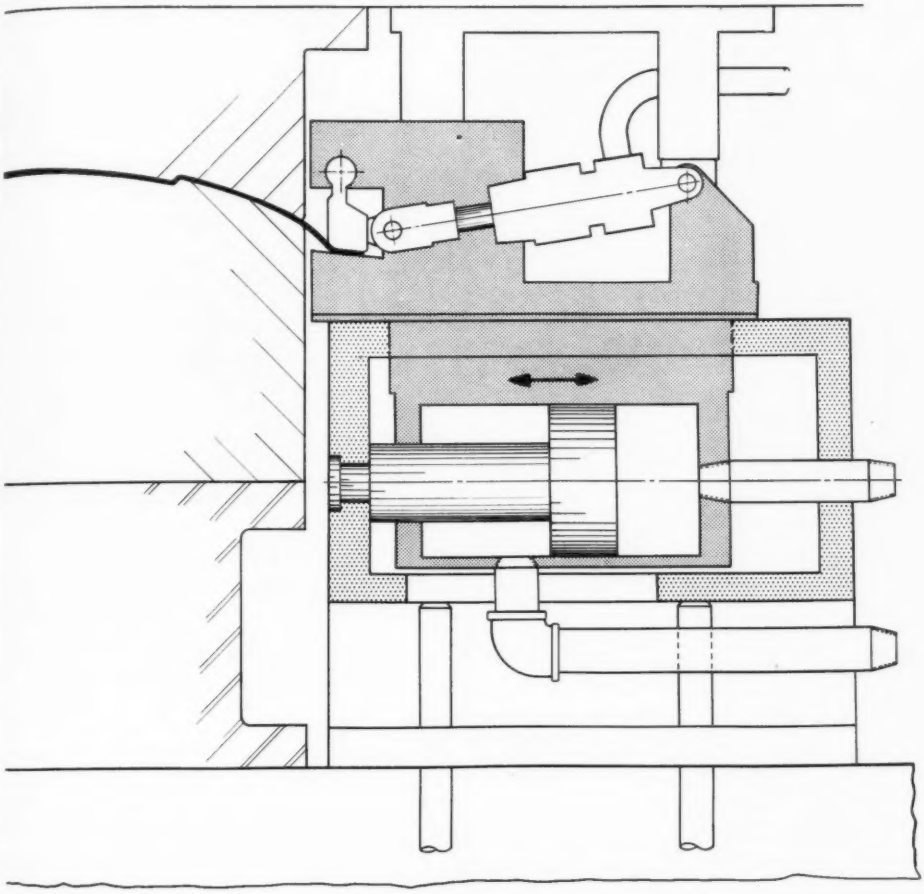
Bath feels that the greatest immediate impact on industry of their Tension Control Blank Holder will be in shallow draw stamping. The automotive industry seems very enthused and estimates savings of $1/car on material alone. When they see it for the first time, old timers admit they had been doing it wrong "all these years."

The operation is easy: The sheet is fed in manually or automatically, it is gripped at the sides hydraulically, stretched, and the press closes to form the part.

Difficult auto parts like doors, decks and hoods, tailgates, and roof panels have been hard to bring into tolerance; by using this new process, tolerance and other problems are easily solved.

Tremendous savings should be forthcoming for stampers through the cost saving due to using much simpler dies. Both sections of the

Fig. 2 Half of this drawing (on the opposite page) shows the part gripped and stretched; die is still open. On this page, part has been formed; die is still closed. Small hydraulic cylinders do gripping. The larger cylinders (sectioned) furnish pressure for stretch.



die are made with less depth—material is cheaper and handling easier. Die material can be of a cheaper grade too: In many instances, a plaster "splash" on a mahogany form will suffice for a zinc alloy, cast iron, or cast steel die. Or, depending on production expectations, a plastic faced die may be used.

The "binder" stock on two sides need only be 3″ in width; the stock saving on the other two sides is a bonus. But even more, stretch of approximately 1/16″ for every inch of width can completely offset the cost of already reduced "binder" stock.

Because deep draw premium grade steel is not required you can save upwards to $35/ton. Still another plus is that a lighter gage can be used since stretching stiffens and the same strength qualities of a heavier gage, formed the conventional way, are produced; where you were using 0.035″ stock 0.029″ will possibly do.

Flex rolling practices are no longer needed. Even with some curvature in the blank, all that's required is that it be flat enough to go into the grippers. It can be over or undersized since stretch is controlled hydraulically to the predetermined pressure.

The use of drawing compounds is not needed so "stripping" them is eliminated — another process step is saved and "stripping" compounds are no longer there to bleed out through paint.

When you see this work, before the part is removed from the die, press the part to the die with your finger to check the springback. Chances are you won't have to though, it will probably be hugging the die because it's the same shape.

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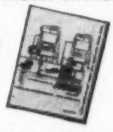

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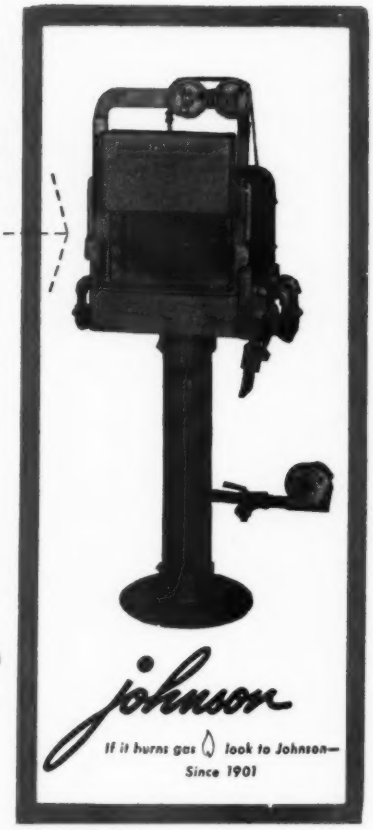

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Always Handy, A PORTABLE Tensile Tester

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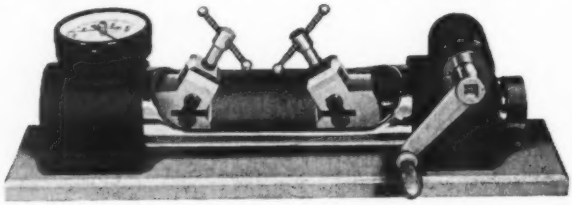

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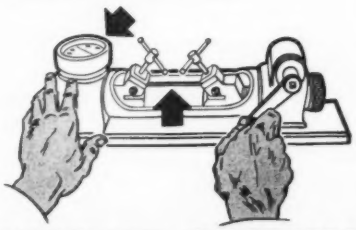

Information on other Detroit standard and special tensile testing machines, with up to 40,000 lbs. capacity, will also be sent upon request.

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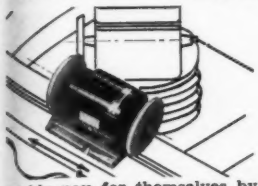

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CIRCLE INFORM-A-GRAM KEY NO. 611

Machine Tool Protector

A new sensing device developed by Michigan Tool Co. is designed to guard automatic or standard machine tools against accepting oversize workpieces. Its first application was on one of the company's gear shaving machines.

The instrument has two pointers — one to indicate maximum load allowed by the setup on which it's used, and a second to show the actual load resulting from stock on the blank. If the load equals or exceeds the preset limit, the device automatically interrupts the machining cycle.

The sensing mechanism operates by a continuous check on the armature current being drawn by the cutter-driver motor. This technique is sufficiently sensitive to register stock variations in thousandths. By occasionally glancing at the meter, the operator can anticipate and prevent trouble.

New Book From Unusual Column

This book features original contributions by outstanding engineers and mathematicians. The book, *Ingenious Mathematical Problems and Methods*, by L. A. Graham, is a collection of authentic mathematical problems selected from one of the nation's most unusual columns.

The column appears in the Graham *Dial*, organ of Graham Transmissions, Inc., of Menomonee Falls, Wisconsin. For over seventeen years, this column has printed scores of mathematical problems, many of them created especially for the *Dial* by its more than 25,000 readers.

"A vast group of people retain a latent love and interest for the subject which is aroused by provocative problems." Anyone who is mathematically minded will find rewarding material in this thought-provoking collection. For further information circle Inform-A-Gram No. D1.

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CIRCLE INFORM-A-GRAM KEY NO. 612

Research Outlay Rising

According to Arthur D. Little, Inc., research consulting company, American government and industry expenditures for research will balloon from the $60-billion spent between 1950 and 1960, to an estimated $200-billion during the next ten years.

Polaris Heads Take Shape

Forming 54" dia heads for the Navy's Polaris missile is one of the tasks done by Chromalloy Corp.'s Propellex Chemical Division, Edwardsville, Ill.

The heads, made of AMS 6434 steel, are exploded into shape by Propellex. The steel is hot preformed, then loaded into the open die without annealing or stress relieving. After adding water to

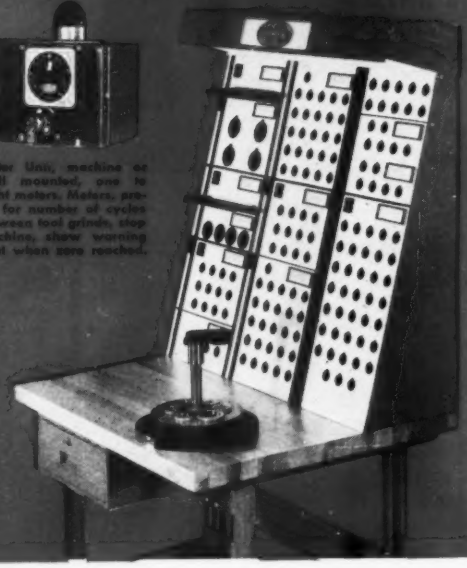
transmit the explosive force, Propellex people carefully shape the charge. When detonated, the metal is forced against the die to finish the head (up to ⅞" thick) to exacting tolerances.

SEIBERT TOOL-CONTROL SYSTEMS

- Cut Machine Downtime
- Provide Systematic Storage
- Contribute to Quality Control

New-Type Gage Plate, one to six holes, eliminates bulky old-style plates for presetting tools. Gages made in bar-height, chamfer, flush-pin, flush-pin with indicator.

Meter Unit, machine or wall mounted, one to eight meters. Meters, preset for number of cycles between tool grinds, stop machine, show warning light when zero reached.



Right: Tool Board for presetting and storing two sets of tools, but without meters. Length and arrangement as required. Boards also furnished for storage of quality-control gages. Save time, facilitate inspection.

Below: Tool Control Board for tool presetting, systematic storage, and metering the machine cycles between tool grinds. Panels are subdivided into sections for each type of tool. Divisions and length of board arranged as required.

Seibert Tool Control Systems cut machine downtime by having preset tools immediately available for quick changes. They save workers' time by providing systematic storage for preset tools, presetting gages, and quality-control gages. In addition, they prevent excessive parts spoilage by warning the operator and stopping the machine when tool changes are required. Such a control system, engineered for the particular needs of your mass-production plant, will provide almost unbelievable savings. Ask for detailed information or for a Seibert Engineer to survey your needs.

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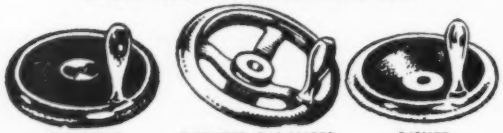

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- ☐ **COLD FORMING OF STAINLESS STEELS** by Lester F. Spencer. A 28-page pamphlet on the subject. **$1.00**
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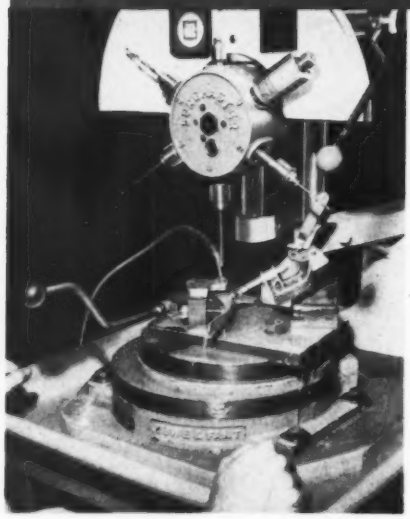
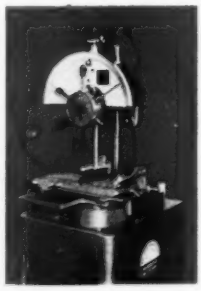


A Burgmaster Bench Model Power Indexing 6-Spindle Turret Drill has replaced a manually indexed competitive Turret Drill for drilling and reaming 3 holes in Plier parts at Owatonna Tool Co., Owatonna, Minnesota. Production has been increased from 87 to 165 parts/hr., the comparison based on using essentially the same setup on both machines with the Positioning Table shown. The Burgmaster represents an 86% smaller investment, yet is faster because the turret power indexes at operator command to quickly perform up to six operations. Individual pre-selected spindle speeds assure optimum cutting of each tool.

The setup at Owatonna Tool Co. uses a positioning table on a Burgmaster Bench Model Turret Drill for 4 operations in plier part: drill and ream 7/32; drill #19; drill 3/32. Special mounting elevates machine uprights for greater depth capacity.

Write for Free Literature on Burgmaster Model Turret Drills and Rapid Positioning Table. Representatives in principal cities.

Burgmaster Rapid Positioning Table mounted on Bench Model Turret Drill provides positive positioning with greater speed and flexibility. Table can handle complicated hole patterns because all operations are visible. Positioning accuracy ± .0005", capacity 4"x5", price $675.00. Burgmaster Bench Model Turret Drill ¼" capacity in steel, price $595.00. F.O.B. Los Angeles, California.



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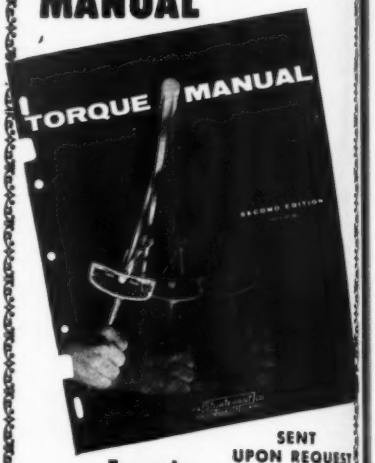
"TORQUE WRENCH" MANUAL



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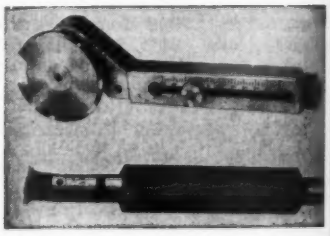
THREAD Cutting Tool



Provided with a scale for angular setting.

Circular Cutter, in high speed or carbide, has a negative profile and machines both thread flanks simultaneously. Thread cutting discs for all threads are available for both external and internal tool holders.

ACME TOOL CORP.
P. O. Box 34, 1165
CORAL GABLES
FLORIDA

CIRCLE INFORM-A-GRAM KEY NO. 644

Worn Lathes Get Reprieve

Old lathes never die, they just trace away. That might well serve as a slogan for the lathe rebuilding and modification department established by Turchan Follower Machine Co., Dearborn, Michigan.

To help one company beat the cost of special tooling, Turchan took two lathes ready for retirement, and rebuilt them into special, semi-automatic tracing lathes. They've since paid for their rejuvenation by eliminating supplementary grinding on Diesel engine valves.

The two refurbished units now produce valves to a finish of 12 micro-inches, and tolerances of ±0.0004". Cycle time for Stellite-faced valves is 45 sec, using carbide tipped tools; 22 sec on non-Stellite faced valves. Each machine handles a range of valve sizes by changing tracer templates.

Turchan people re-scraped the old lathes' ways, and replaced the old gear box and lead screw with their own Trace-Matic attachment. This consists of a tracing valve, hydraulic cylinders for cross and longitudinal motion, hydraulic power unit, and control unit. The lathes can now also trace 90° shoulders, tapers, radii, and other forms to tolerances of ±0.0002".

As shown in picture, the lead tool removes excess forging flash from valve flange; follower begins cut on small diameter, follows up the radius, then finishes operation by catching valve face and retracting into tool holder.

The Anocut Engineering Co. of Chicago is establishing a European Engineering service.

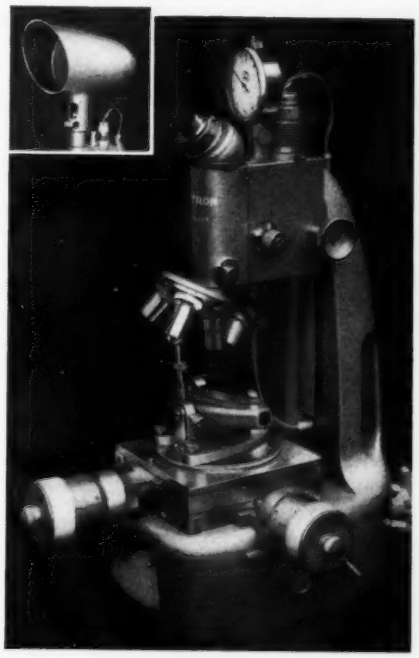
Mr. Garret K. Vandenburgh will be in charge of engineering for the specialized equipment needed to electrolytically grind and sink cavities in tough metals. He is a graduate of Iowa State University, the University of Chicago, and has a solid background in electronics.

Richard R. Moore, Chief Metallurgist for the Naval Air Engineering Facility of the Naval Air Material Center at the Philadelphia Naval Base, has received a Certificate of Merit from The Franklin Institute.

Mr. Moore's rotating-beam machine, developed some years ago, has been credited with making possible the fatigue testing of materials on a wide scale basis. It has been considered essential to the growth of the Aeronautical Age. For the design of planes and missiles this is especially true, where an accurate knowledge of the strength of materials is needed. It is particularly necessary to know how they will react under the constant strain and stress of vibration conditions.

The Certificate of Merit was founded in 1882 at the 136-year-old scientific and educational Institute and is awarded to persons judged worthy of meritorious inventions and/or discoveries or improvements in physical processes or devices.

MEASURE TO 0.0001" IN 3 DIMENSIONS WITH UNITRON'S TOOLMAKERS MEASURING AND METALLURGICAL MICROSCOPE



The UNITRON Model TM is more than just a measuring microscope. It is the only instrument which combines in one stand a completely equipped toolmakers microscope for precise measurements — LENGTH, WIDTH and DEPTH, and a metallurgical microscope for examining the structure of polished metal samples under high magnification.

NOTE THESE QUALITY OPTICAL & MECHANICAL FEATURES

- **Objectives:** achromatic, coated, 3X, M10X, M40X. **Eyepiece:** coated Ke10X with crosshair.
- **Magnifications:** 30X, 100X, 400X; up to 2000X with accessories.
- **Focusing:** Both dual control rack and pinion coarse and micrometer-screw type fine adjustments. Body has locking device.
- **Three Illuminators:** sub-stage, surface and vertical, have variable intensity.
- **Combination Stage:** rectangular ball bearing with linear measurements to 0.0001" and rotary measurements to 5' with vernier. (Metric model available on special order.)
- **Depth Indicator:** measures in units of 0.0001" by "optical contact" with specimen.
- **Projection Screen:** available as accessory for optical comparison.
- **Eyepiece Turret:** available as accessory for measuring surfaces, radii, thread pitch etc.

In fitted hardwood cabinet $1050 FOB Boston

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INSTRUMENT DIVISION of UNITED SCIENTIFIC CO.
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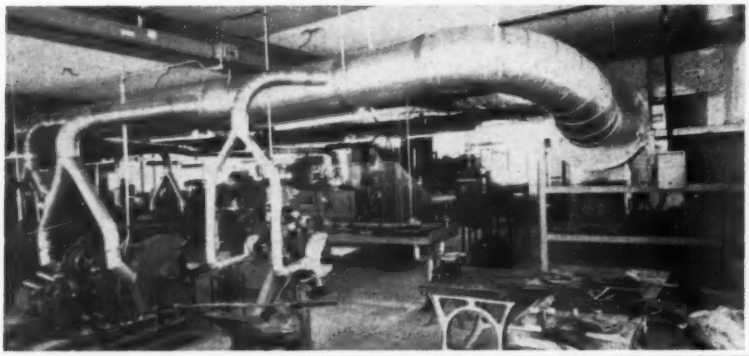
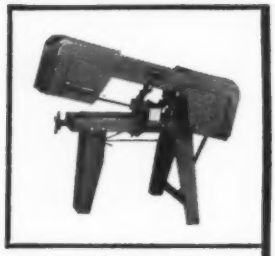
CIRCLE INFORM-A-GRAM KEY NO. 65

Big Dust Problem Solved Quickly



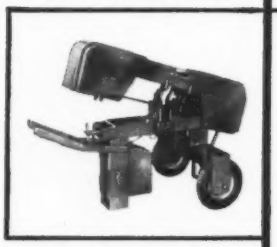
An intricate and complex dust collection problem has been solved at Triple Cities Cutting Die Corp., Rochester, N.Y., through the use of a standard dust collecting system. The firm makes cutting dies for the leather, plastics, and textile industries, and all dies are free-hand ground. This requires a variety of shapes and sizes of grinders and wheels and an equally large variety of dust intakes.

A standard Dustkop system, produced by the Aget Manufacturing Co., was selected, and installed by two men in 2½ days. It pulls 8800 cfm at a velocity of 4000 fpm.

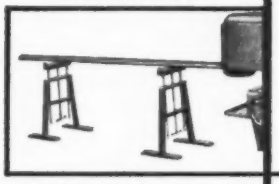


Model B (Wet or Dry) Dependable. Economical. Easily handles 5" rounds, 10" flats.

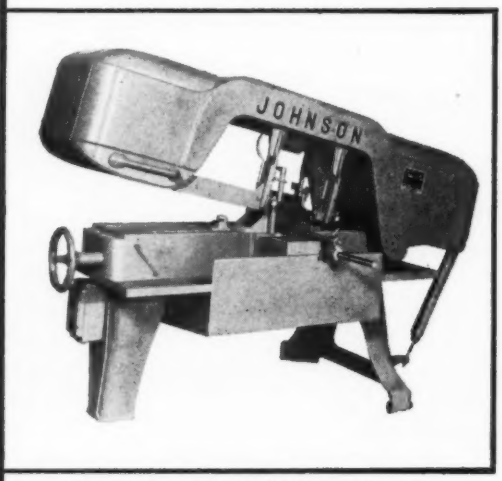
Johnson
Speaks for itself in ANY SHOP!



Model M (Mobile). Rolls to the job, inside or out. Capacity: 5" x 10"



Johnson Adjustable Stock Stand. Provides rigid, safe work support.



The Big Model J. (Wet or Dry) Fast. Tough. Accurate. Capacity: 10" rounds, 18" flats

The big, dependable Johnson delivers more saw for less money. It easily and accurately handles anything in your stock pile: rods, angles, tubes, heavy rounds, irregular shapes, and flats.

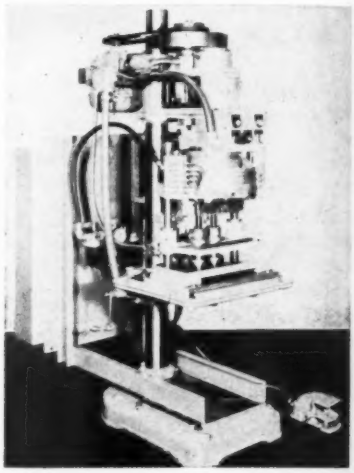
Whatever model fits your production requirements, you'll find Johnson versatility will boost your production and lower your metal cutting costs. Today, the Johnson saw speaks for itself in thousands of progressive shops . . . *why not yours?*

Johnson MANUFACTURING CORPORATION
1015 Barnes Street, Albion, Michigan

Eastern Distributor	Mid-Western Distributor	Western Distributor
R. J. R. KELLY CO.	W. Q. LUNDMARK	HASTINGS DISTRIBUTORS
Hale Bldg., 51 Main St.	75 N. Broadway	1605 Solano Avenue
East Orange, N. J.	Des Plaines, Ill.	Berkeley, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 66

Multi-Spindle Tapping In Short Cycle Time



Multiple-spindle, simultaneous tapping in short cycle time without a reversing motor has been developed by Zagar, Inc. Threading holes in terminal strips with 8/32" taps in a 2-sec cycle, 50 holes per pass are possible, thanks to gearless design and a new drive concept.

A triple electric clutch and brake in the gearbox permits the motor to drive forward continuously through the flywheel and reverse gear shaft. The necessity and expense of a specially wound reversing motor are eliminated. The lead screw controls the feed in and out of the terminal strip. The compact head of the new machine is designed so as to be easily installed on standard drill presses.

NEW HUGHES MT-3 AUTOMATES JOB LOT PRODUCTION

The new Hughes MT-3 replaces from three to six conventional machines. It drastically reduces costs by bringing production line efficiency to small lot manufacturing of parts requiring face and other milling operations, drilling, boring, reaming and tapping. Operating from numerical instructions programmed on tape, the system functions completely automatically. The MT-3 has an absolute positioning accuracy of ±0.0005". Its part size envelope is a twelve-inch cube, but in many cases will machine parts up to 12" x 24" x 24".

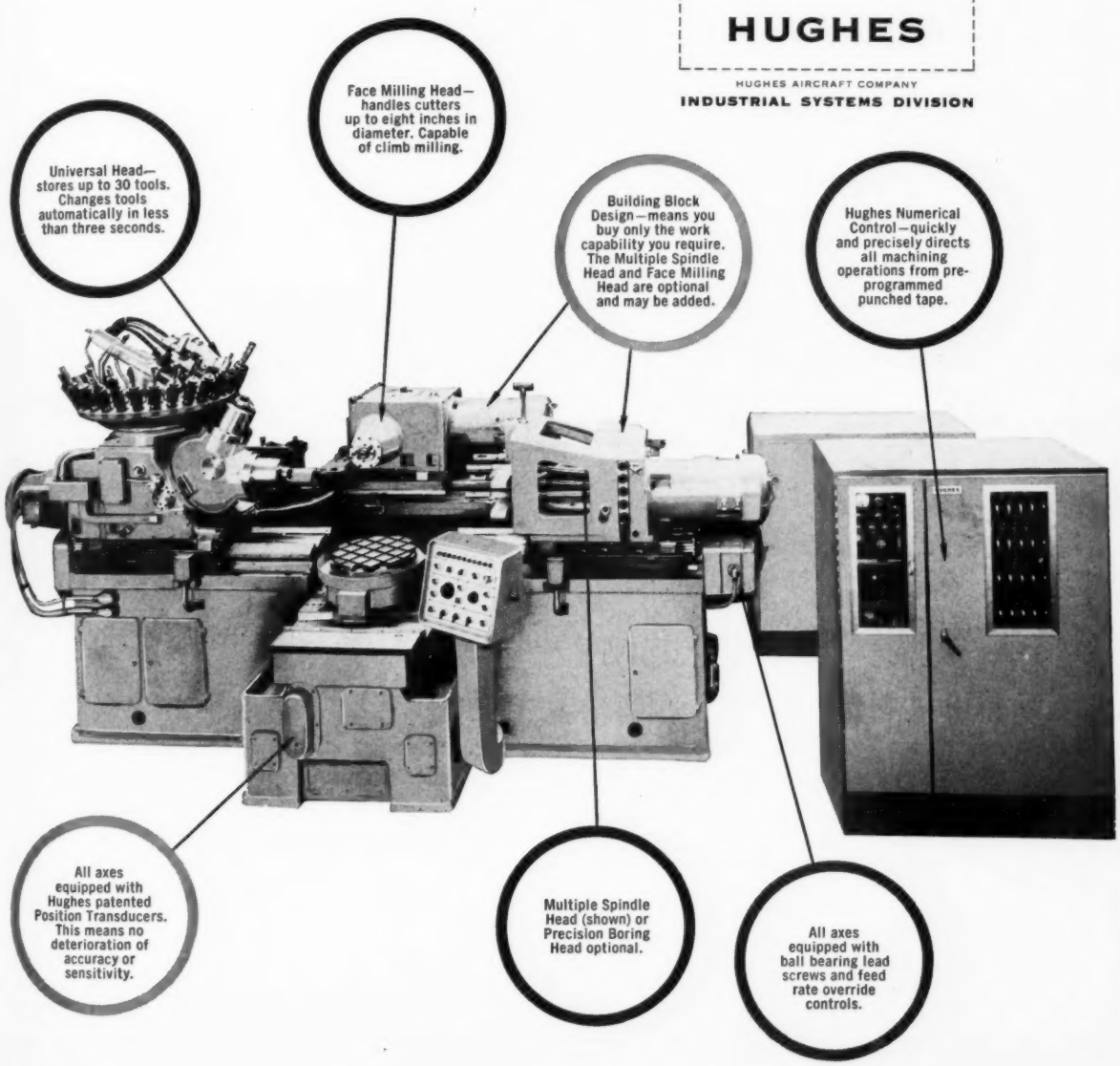
For complete engineering specifications, firm price and delivery dates write, teletype (TWX INGL 4117) or call collect: HUGHES INDUSTRIAL SYSTEMS DIVISION, P. O. Box 90904, Los Angeles 45, California.

CREATING A NEW WORLD WITH ELECTRONICS

HUGHES

HUGHES AIRCRAFT COMPANY

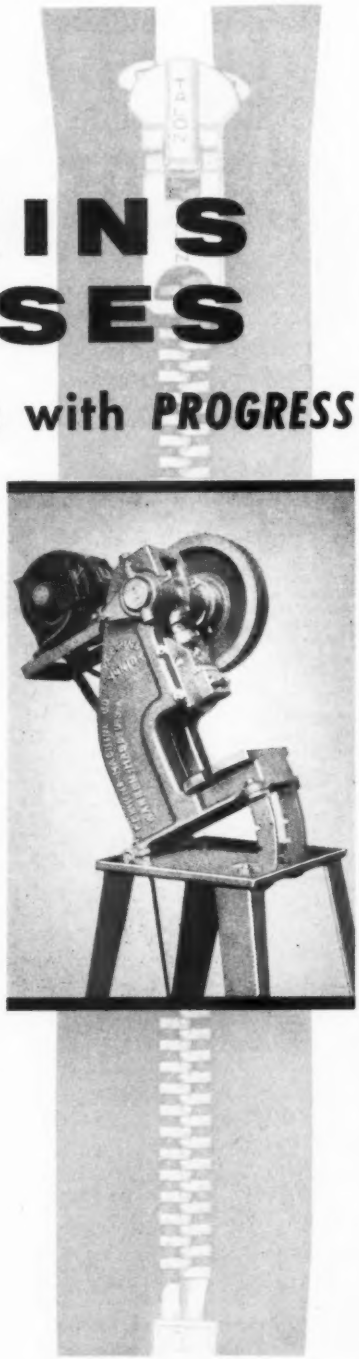
INDUSTRIAL SYSTEMS DIVISION


Universal Head—stores up to 30 tools. Changes tools automatically in less than three seconds.
Face Milling Head—handles cutters up to eight inches in diameter. Capable of climb milling.
Building Block Design—means you buy only the work capability you require. The Multiple Spindle Head and Face Milling Head are optional and may be added.
Hughes Numerical Control—quickly and precisely directs all machining operations from pre-programmed punched tape.
All axes equipped with Hughes patented Position Transducers. This means no deterioration of accuracy or sensitivity.
Multiple Spindle Head (shown) or Precision Boring Head optional.
All axes equipped with ball bearing lead screws and feed rate override controls.

CIRCLE INFORM-A-GRAM KEY NO. 67

Talon and PERKINS PRESSES

are Synonymous with PROGRESS



Putting ZIP into a world renown product demands an unfailing dependable source of operation at lowest possible over-all cost.

Perkins Presses have been selected by many of the nation's largest manufacturers because they represent the ultimate in press design and are built to the highest standards for strength, rigidity, endurance, accuracy and power.

THERE IS A PERKINS PRESS TO MEET EVERY REQUIREMENT

For FORMING
BENDING
NOTCHING
PUNCHING, etc.

Write us about YOUR requirements.
Our engineers will be glad to help YOU.

PERKINS
MACHINE COMPANY
WARREN, MASS., U.S.A.

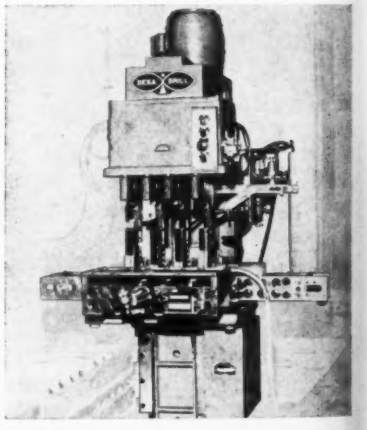
CIRCLE INFORM-A-GRAM KEY NO. 68

Multi-Spindle Unit Drills and Chamfers

The Herschel Manufacturing Co., Peoria, Ill., had the problem of chamfering various size parts to a uniform depth prior to a riveting operation. A Deka-Drill (Model H 712), a hydraulic automatic-cycle multiple-spindle drilling and tapping machine manufactured by Precision Tool & Manufacturing Co., was selected to do the job.

The machine is equipped with a dwell control to hold the table at the depth of the stroke for a pre-set time, in this case ½ sec, so as to polish out the countersink and remove all tool pressure. The dwell control can be pre-set from ½ to 11 sec. Using an air-operated rack and shuttle feed, four pieces of SAE 1095 steel, heat treated to 25-30 Rc, are fed into the fixture at one time. Using ⅜″ glass-hard core drills, a 0.228″ dia hole, 0.100″ deep at 60° included angle to 0.320″ width is countersunk at 325 rpm.

The operator merely keeps the racks filled. On the down-stroke the machined pieces are air ejected onto a conveyor, two pieces going to the right and two pieces to the left, as four new pieces are fed into the fixture. As soon as the table reaches the start position it automatically goes into cycle again. The Deka-Drill produces 620 cycles/hr, or 2500 pcs.



The spindles on the Deka-Drill are adjustable to any pattern, so by changing the racks and locating nests on the fixture, other size parts of similar design can be machined. Or, upon removing the set-up, numerous parts of any other design can be drilled or tapped.

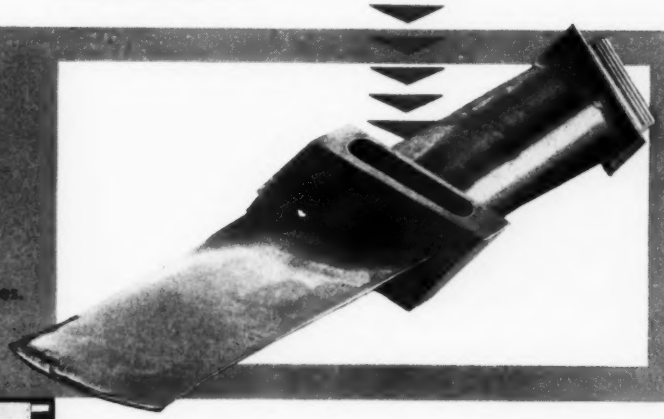
ANOCUT HCS-59 ELECTROLYTIC CAVITY SINKER

REMOVAL RATES TO 60 CUBIC INCHES PER HOUR AVAILABLE IN STANDARD EQUIPMENT. HIGHER CAPACITIES ON APPLICATION.

A LITTLE SQUIRT OF BRINE CUTS CAVITY IN TOUGH SUPER ALLOY 4 TIMES FASTER THAN... CONVENTIONAL MACHINING!

IN PRODUCTION...

Cavities in this jet-engine "bucket" made of A-286 super alloy are produced two at a time in 8 minutes. Previous time 32 minutes.



ALSO . . . ELECTROLYTIC GRINDING. HAMMOND MACHINERY BUILDERS MODEL SCE-6 CARBIDE TOOL GRINDER MADE EXPRESSLY FOR USE WITH ANOCUT POWER SUPPLY UNIT. HUNDREDS IN USE.

- NO CUTTERS!
- NO ARCS!
- NO METAL DAMAGE!
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CIRCLE INFORM-A-GRAM KEY NO. 69

Catalogs and other helpful literature

Ten Recent Publications from Jones & Lamson Machine Co. detail the wide range of that firm's equipment. Machines described by bulletins are:

Model 30-60° — A 60° auto-tracer lathe. Circle No. C1.

Model 30-2D — A 180° auto-tracer lathe. Circle No. C2.

Model 30 — A multiple slide automatic lathe. Circle C3.

An automatic turret lathe for bar and chuck work. Circle Inform-A-Gram No. C4.

Saddle type turret lathes with multi-speed hydraulic headstock. Circle Inform-A-Gram No. C5.

Ram type turret lathes with multi-speed hydraulic headstock. Circle Inform-A-Gram No. C6.

Model 410 thread grinder. Circle Inform-A-Gram No. C7.

Model E-2 automatic form grinder. Circle Inform-A-Gram No. C8.

A precision boring machine. Circle Inform-A-Gram No. C9.

A precision gun drilling machine. Circle Inform-A-Gram No. C10.

Magnetic Coolant Separators with a capacity range from 1½ to 120 gpm are treated in new Catalog 300-D available from Barnes Drill Co. They can be applied to a range of equipment from honing machines to deep hole drills. Circle Inform-A-Gram No. C11.

Fluid Couplings for rotating, hollow shafts, and internal seal parts are included in the equipment listed in Syntron Co.'s Bulletin SS-608. It also lists roll neck seals for strip, tempering and rolling mills. Circle Inform-A-Gram No. C12.

The Operation Recorder discussed in Esterline-Angus Co.'s Bulletin 860 can aid in reducing machine downtime and eliminate time-consuming research scientist recordings. It monitors and records 5 to 20 "on-off" operations on a time-calibrated, rectilinear chart. Circle Inform-A-Gram No. C13 for a copy.

The Complete Line of mounting accessories available for use with Unipunch hole punching and notching units is described in 12-page Catalog M just released by Punch Products Corp. Circle Inform-A-Gram No. C14.

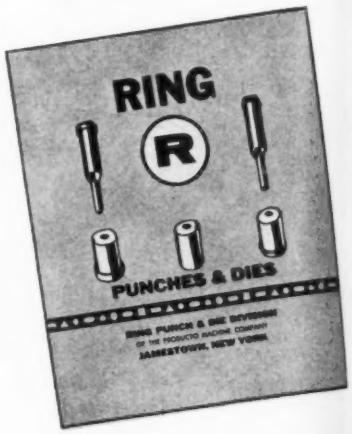
Bulletin SH-6-60 from The Tomkins-Johnson Co. describes the firm's new high pressure square head hydraulic cylinder, the Model SH, with a 2000 psi capacity. Circle Inform-A-Gram No. C15.

A Third Authoritative edition of their "Torque Manual" has been published by P. A. Sturtevant Co. It's a revision of the two earlier editions, and contains 32 pages. Get it by circling Inform-A-Gram No. C16.

A Die Assembler that can accommodate loads up to 2000 lbs is described in a new bulletin from Producto Machine Co. The Model DA-1-P assembler is designed to lessen work and risk in handling dies. It's yours if you circle Inform-A-Gram No. C17.

Component Parts for Jigs, fixtures and special machinery are described in 16-page Catalog 31 published by Northwestern Tools, Inc. It includes to scale tracing template of these and more than 300 clamping items. Circle Inform-A-Gram No. C18.

Punches and Dies from the Ring Punch & Die Division, Producto Machine Co., are the topic of the firm's new 48-page catalog. The publication includes information



on regular, medium and long lengths in ring and head-type punches, press-fit and head-type stripper bushings, and quill punches. Circle C19.

"Machining Heads," and "Feed Tables and Machine Beds," are the names of Catalog 160 and 260, respectively, issued by Master Mfg. Co. Request 160 by circling Inform-A-Gram No. C20, and ask for 260 by circling Inform-A-Gram No. C21.

A New Gear Shaving machine is the subject of a new catalog, S60-8, offered free by National Broach & Machine Co. The machine handles spur or helical gears up to 25½" OD in the 2 to 16 diameteral pitch range. Get it by circling Inform-A-Gram No. C22.

Basic Machines and accessories for boring and milling operations, including the Micropoint tool grinder and Spiramatic jigmils, are treated in a publication released by DeVlieg Machine Co. Request it by circling No. C23.

Portable Grinding Tools and small hole drilling equipment is the concern of 36-page Catalog 60-FL published by the Dumore Company. It includes information on a range of equipment from tool post grinders to flexible shaft tools. Get a free copy by circling Inform-A-Gram No. C24.

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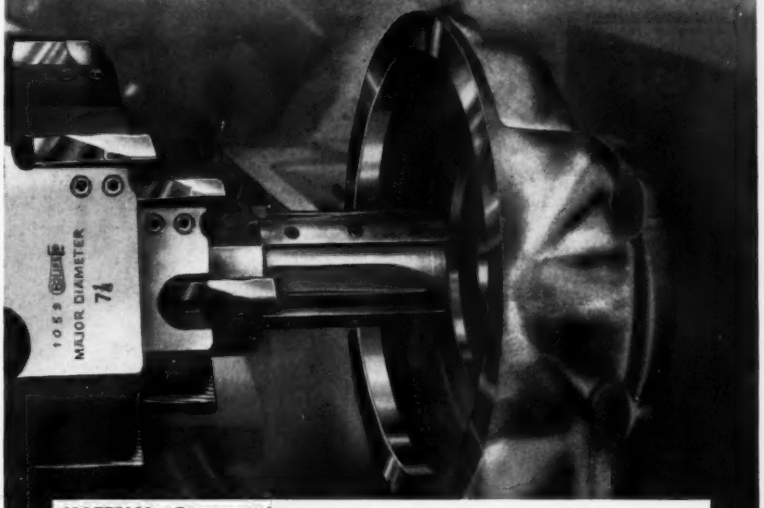
DESIGNED FOR YOUR TOUGHEST PRECISION CUTTING JOBS



MATERIAL:	Grey cast iron.
JOB:	Bores three diameters; faces two surfaces; cuts one chamfer.
TOOL:	Eclipse multi-operation carbide tipped inserted blade cutter equipped with a replaceable bronze wear stripped pilot.
RESULT:	Finer finish, accurate size and absolute concentricity.

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Faster and Easier with a
DREMEL MOTO-TOOL

No other grinder, regardless of size, power, or price can take the place of the Dremel Moto-Tool. It's lightweight (16 ounces) and handles like a pencil. Gives the operator extreme accuracy for close-tolerance work—and easy operation in tight places impossible to reach with large grinders. The Moto-Tool's high speed (27000 RPM) makes it ideal for use with small mounted wheel points. It's also handy for production deburring, and a perfect size and weight for women operators.

The Dremel Moto-Tool is an indispensable, all-purpose grinder for the tool room—a time-saver for the production line—an industrial favorite since 1936.

Order from Your Supplier or Write for Tool Catalog

Model No. 2 Moto-Tool only .. **$19.95**
Model No. 2 Moto-Tool Kit with 23 accessories and storage case .. **$27.50**

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CIRCLE INFORM-A-GRAM KEY NO. 712

REDUCE TOOL COSTS $3000 OR

save 5 weeks lead time at

Burgmaster Model 2BHT 6-Spindle Turret Drilling, Tapping and Boring Machine equipped with Hughes 2-Axis Numerical Controls. X-Y axis controls table motion and machining of holes in flat plane. In this setup, a third motion controls the rotary fixture to automatically machine all radial holes. This is accomplished by a switching device on the Control Panel converting "Y" information to rotary information.

Rocket Bulk Head is completely drilled, countersunk and tapped on Burgmaster Tape Controlled Turret Drill without jigs or drill bushings. 16 tools are used to machine 69 holes.

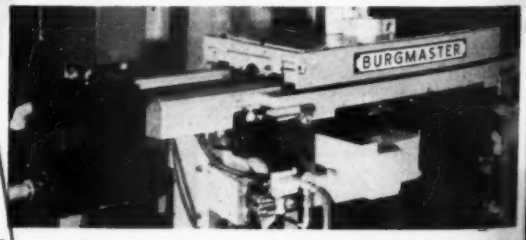


Table Servo-Motors position table at 180 in./min. within ±.0005", repeatable to ±.0002", non-cumulative. Each axis of table motion is equipped with heavily pre-loaded ball bearing lead screws and anti-backlash ball nuts. Automatic clamps lock table into a rigid unit during machining.

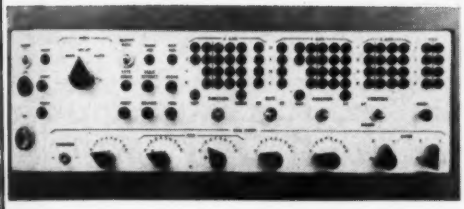
ON ROCKET PART

at Hughes Aircraft Company

Hughes Aircraft, Tucson, Arizona, use a Burgmaster 6-Spindle Turret Drilling, Tapping and Boring Machine equipped with 2-axis Tape Controls for controlling X, Y, and rotary motions to materially streamline production of small lots. Typical savings are shown in drilling, countersinking and tapping 69 holes in a lot of 50 cast iron Rocket Bulk Heads. Due to the fully automatic action of the tape controlled Burgmaster Turret Drill, expensive jigs and fixtures are eliminated — reducing tool costs $3000 — while saving 5 weeks lead time getting the job into production.

This is maximum flexible automation. Fully automatic machining is carried out in accordance with the commands of an easy-to-prepare tape performing any combination of six operations without tool changing. Individual preselective spindle speeds and feeds assure each operation is done at optimum tool efficiency for fine finish, precision, speed and long tool life. Engineering changes involving revision of machining can be done quickly by simple tape modification.

BURGMASTER



Hughes 2-Axis Tape Control Panel mounted at eye level on the Control Cabinet is provided with display lights that show accuracy of programming at a glance. This 2-axis system automatically controls positioning of the Burgmaster machine table on the X-Y axis simultaneously and directs the "third" axis when needed. A third axis of control may be added to the system to govern individual spindle depths, thus eliminating manual setting of the standard machine depth stops; or control special indexing fixtures with ±0° 03′ for automatic location and machining of radial holes, etc. Operator can dial dimensional commands directly into panel for any axis.

Job Facts

Company: Hughes Aircraft Company, Tucson, Arizona

Machine: Burgmaster Model 2BHT-L 6-Spindle Turret Drilling, Tapping and Moring Machine equipped with Hughes 2-Axis Numerical Controls.

Part: Cast Iron Rocket Bulk Head.

Quantity: 50 parts.

Holding: Flat Plane Holes — Simple Adapter Plate; Radial Holes — Special Vertical Rotary Fixture controlled by "Z" axis.

Accuracy: Flat Plane Holes — ±.0005" hole centers; Radial Holes— ±0° 03′

Savings: $3000 tool costs; 5 weeks lead time.

Other Advantages: Fewer rejects due to elimination of human factor; less inspection; reduced floor space required; much faster engineering changes; economical production of small lots; less tool changing; less work movement.

ALL LEADING STANDARD MAKES of Numerical Controls are available in Burgmaster Tape Controlled Turret Drills at Customer's preference. Write for literature describing 6 and 8 spindle machines with complete specifications and features. Twenty minute 16mm sound film showing Burgmaster turret drills in operations, including, the new automatic positioning table, available from any office.

World's Largest Builder of Turret Drilling Machines
"0" Manual Power Index ¼" Capacity
1C Manual Power Index ⅜" Capacity
2B Manual Power Index ½" Capacity
2BR Ram Type Radial Drill ½" Capacity
2BH Automatic Hydraulic ½" Capacity
2BH Automatic Hydraulic 1⅛" Capacity
2BAH Automatic Tape Controlled 1¼" Capacity
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DRILL ANY NUMBER OF HOLES IN ANY PATTERN IN ANY MATERIAL ON ALL CENTERS

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Drill a maximum number of holes in one pass—in any material. Holes can be as close as twice drill diameter. Zagar gearless drillheads are built as a complete unit or may be adapted to any standard drill press. Send us your part drawing and we will submit our quotation.

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CONVERTERS—Self-contained, portable converters for Super Cycle System. Single, four-speed and continuously variable models.

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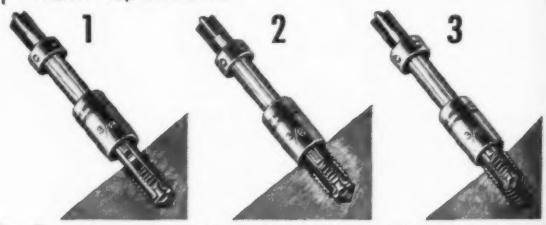
How much time do you waste removing broken taps? How many expensive parts are damaged or scrapped? Much of this time, and the parts, can be salvaged with Walton Tap Extractors.



1. The extractor's sturdy, heat treated steel fingers slip into the flutes of the broken tap.
2. The extractor is pushed down until it touches the broken tap, and the sleeve placed firmly in contact with the work.
3. With a tap wrench (not shown) applied to the square end of the extractor, the broken tap is simply and easily backed out.

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Catalogs . . .

A New Catalog describes Maurey Mfg. Corp.'s positive drives for machinery, and explains how the units combine the advantages of belt and gear or chain drives while

avoiding the disadvantages of metal-to-metal contact, noise, and the need for lubrication. Get a free copy of Catalog PD-1 by circling No. C25.

Four New Brochures have been recently released by Kearney & Trecker. They are:

No. S-60 — 42 pages illustrating knee-type milling machines. Circle Inform-A-Gram No. C26.

RS-60 — Six pages describing ram head milling machines. Circle Inform-A-Gram No. C27.

MM-3 — Four pages detailing the new model III Milwaukee-Matic with automatic tool changer. Circle Inform-A-Gram No. C28.

VBT-60 — Six pages devoted to the Model 3006 Milwaukee-Mil, a vertical head bed type milling machine. Circle No. C29.

Engine Lathes, toolroom and turret lathes, milling machines, shapers, drill presses and pedestal grinders made by South Bend Lathe, Inc., are listed in their 96-page Catalog 1960. It also devotes space to accessories for the machines. Circle C30.

Flexible Tubing for handling air, liquids and light solids is the concern of Catalog 10-19 put out by Flexible Tubing Corp. Send for it, or Circle Inform-A-Gram No. C31.

A New Barrel Finishing media called Lorco Jetforms is described in Bulletin 900 from Lord Chemical Corp. Media consists mainly of silica and alumina. The bulletin offers a table of 16 screen mesh sizes. Circle C32.

Special Cutting Tools are treated in a 45-page F & D Tool Co. catalog. It lists a range from helical milling cutters to metal slitting saws. It's free if you Circle Inform-A-Gram No. C33.

HSS End Mills, keyseat cutters, combined drills and countersinks, reamers and counterbores — 51 types and 794 sizes — are covered in Catalog No. 4, a 32-pager offered by Fastcut Tool Co. It's photo-indexed for quick reference. Circle Inform-A-Gram No. C34.

"Leasing Releases Working Capital" is Acme Associates' new brochure outlining the advantages of leasing capital equipment. It's free if you Circle No. C35.

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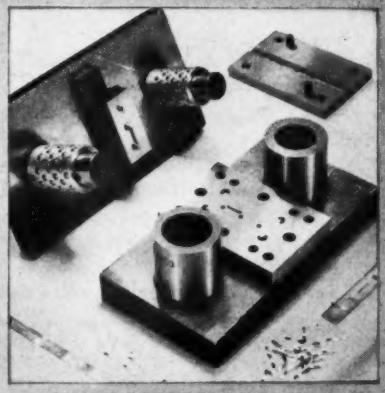
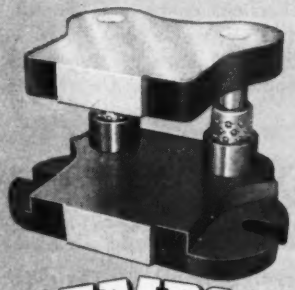
To the best of our knowledge, Lempco is the only 2-post STOCK* die set which could produce this electronics part from .001" thick high nickel alloy material—with punched holes of .001" diameter. This die, mounted in a standard Lempco STOCK* die set, produced 30,000 burr-free parts on its initial run.

Users everywhere have found that a STOCK* Lempco 2-post die set will out-produce special 4-post "friction type" sets—at a fraction of the cost. You can prove this to yourself!

*Off-the-shelf DELIVERY, with warehouse stocks in all major metalworking areas of the U.S.A.

MATERIAL: .001" Thick, High Nickel Alloy
Punched Holes, .001" Diameter





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CIRCLE INFORM-A-GRAM KEY NO. 75

Catalogs . . .

Solid Carbide Cut-off tools are included in a recently issued supplement to Somma Tool Co. Catalog 58. Request it by circling Inform-A-Gram No. C36.

Warco Straight Side single crank presses in capacities from 60 to 400 tons are covered in the eight pages of Bulletin 52181 from Federal Machine & Welder Co. Circle Inform-A-Gram No. C37 for a copy.

Catalog 2400 is 36 pages devoted to steel shelves made by Penco Div., Alan Wood Steel Co. It includes data on tool storage inserts, drawer case and bin units. Company will supply a free copy if you Circle C38.

Machine Tools built to the new standards by Buhr Machine Tool Co. get emphasis in the firm's new 32-page brochure detailing the scope of its operations. It includes an introduction to their Economatics. Circle C39.

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CIRCLE INFORM-A-GRAM KEY NO. 76

The New Wire component and assembly manual from E. H. Titchener & Co. features the principal types of wire available for component construction, and lists the most popular finishes, sizes and end treatments for wire offered. Circle Inform-A-Gram No. C40.

Pneumatic or Hydraulic oscillating motors with a wide range of applications are the subject of Roto Tork Mfg. Co.'s new bulletin. They can assist in dumping movements, indexing, transferring, and wire or tube bending. Get a copy by Circling Inform-A-Gram No. C41.

"The Other Properties of Diamond" is the title of an article in the current issue of Diamond Data, published by the Industrial Diamond Div., Engelhard Hanovia, Inc. It documents the advantages of diamond apart from hardness. Circle C42.

Hand and Power-Revolving index tables — new additions to the line made by Cincinnati Gilbert Machine Tool Co. — are described in Bulletin 854. They'll send it free if you Circle C43.

Cold Heading Machines for small and miniature parts, and for long thin pins and rivets, are the subject of a bulletin from Rem Sales, Inc. They'll furnish it if you circle Inform-A-Gram No. C44.

Boring, Grinding, contouring and turning machines are discussed in Bulletin 560, an eight-pager from the Frauenthal Div'n, Kaydon Engineering Corp. Circle C45.

LOW COST PORTABLE ELECTRONIC GAGING UNIT

Now more compact, more versatile, easier to use . . .

Feather-light touch Extremely low contact pressure — less than 2.5 grams — so light you can gage dependably to high accuracies using test set stands or even more conveniently, the new, low cost wide range height stand illustrated.

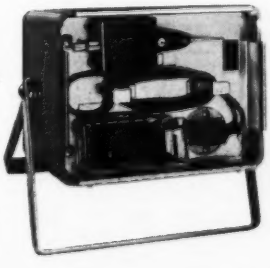
New Contact Tip Design New tip profile permits accurate measurements, without applying correction factors, even with finger at 20° angle to work.

Faster Zero-Setting Two-speed knob provides both long range electrical zero adjustment (over .008″) and fine setting. Each Electro-probe has two ranges (±.002″ and ±.001″ for one model and ±.001″ and ±.0002″ for the other). Other magnifications available. Scales are correlated; zero setting will not change when switching magnification.

Battery Life Quadrupled New transistor amplifier design gets over 1200 hours life from mercury cell battery (up to 2 years normal use). Can also be operated from pen size mercury cells or regular carbon type batteries. For continuous use, a battery eliminator can be furnished for 115 volt operation.

Improved Meter Visibility Adjustable legs, which double as carrying handles, permit placing meter at any angle for best visibility. The fine line graduations and hair-line pointer provide easy, precise readings.

Completely self-contained Rugged meter housing contains all amplifier components (transistors and printed circuit card) so unit can be mounted in a panel if desired. When used as portable unit, gage head can be removed and mounted without disturbing plug connection, and back cover replaced while head is in use. Small plastic box within housing contains holding and mounting accessories.



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Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

CIRCLE INFORM-A-GRAM KEY NO. 77

Precision Parts Assure Precision Performance from O-M Cylinders!

Internal Key Tie-Rodless Type Series 101A Air—150 psi—up to 1500 psi Hydraulic. Fits where others won't Bulletin 101A

ALL O-M CYLINDERS MEET JIC STANDARDS

With all matching parts and mounts machined to close tolerances, O-M Air and Hydraulic Cylinders eliminate misalignment friction, unnecessary wear on rod, bearings packings,also reduce maintenance, when operated singly or in sequence under automatic cycling. The length and direction of piston rod travel is accurately controlled whether the job calls for moving a machine member, holding a tool, positioning, clamping, releasing a work piece, activating an indexing table or other applications. In addition, precise cushioning against piston shock on thrust and return strokes makes for smoother, dependable operation.

O-M Cylinders are available in a complete range of sizes (1½" to 8" bores) with standard or heavy-duty rods. Complete line of interchangeable parts and mounts. Immediate delivery on most sizes.

If you are designing air or hydraulic cylinders into original equipment for precision control of linear motion, coupon below will bring our latest bulletins showing construction and dimensional details, engineering drawings, capacity chart and mounting data. For your copies, **MAIL COUPON TODAY.**

Bulletin 101A for Internal Key Tie-Rodless type Air and Hydraulic Cylinders featured above.

Bulletin 105A—Improved Tie-Rod (Heavy Duty) Cylinders Hydraulic 2000 psi; 3000 psi non-shock.

Bulletin 107—Automation (Heavy Duty) Air Cylinder for 200 psi operation.

Bulletin 108—Automation (Heavy Duty) Hydraulic Cylinder—for 1000 psi operation.

ORTMAN-MILLER MACHINE CO.
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Send Bulletins

☐ Have representative call ☐ 101A ☐ 107 ☐ 105A ☐ 108

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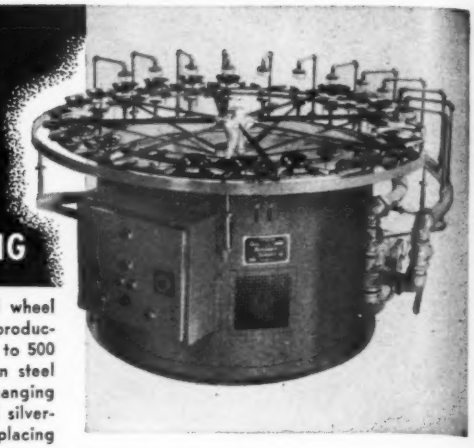
CIRCLE INFORM-A-GRAM KEY NO. 781

525% PRODUCTION INCREASE with AUTOMATIC SILVER SOLDERING



A prominent steel caster and wheel manufacturer has jumped his production from 80 arc-welded joints to 500 brazed joints per man hour on steel caster and wheel halves by changing over to the G.A.S. engineered silver-brazing unit illustrated. Replacing copper brazing or arc welding, requiring skilled operators, the G.A.S. unit at this plant achieves these major advantages:

- Less scrap loss
- Lower costs through more flexible operation
- Use of lighter gauge steel due to lower temperature brazing
- Semi-skilled operators

The G.A.S. engineered silver-brazing unit, with variable speed drive, operates as a continuous or indexing unit, as desired, The height of the fixture table is adjustable.

Today . . . send brief description of your heat processing requirements for G.A.S. economical and efficient solutions. No obligation.

GAS APPLIANCE SERVICE, INC.
Heat Process Engineers
1936 West Balmoral Ave., Chicago 40, Ill.

Representatives in Major Industrial Areas

CIRCLE INFORM-A-GRAM KEY NO. 782

ETALON INGAGE

Measures the exact BORE or blind hole size!
Reading .0001" Size: 3/16" to 4"

Takes accurate measurements of blind holes. No master — measures directly—by .0001". Automatic alignment, rectangular contact points guarantee extreme accuracy even when fully extended. Immediately detects out of round holes; with extensions measures holes up to 30" deep. Hardened contact points exert minimum pressure — will not damage fragile work.

Easy to read, deep graduations on a large diameter thimble. Dull chrome plated. Furnished in English or Metric graduations, individually or in sets.

WRITE FOR CATALOG on complete line of precision measuring instruments: VERNIER CALIPERS, MICROMETERS, DIAL INDICATORS.

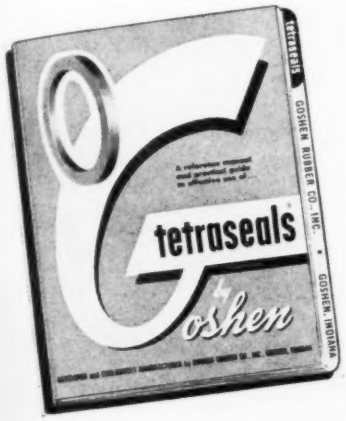
ALINA CORPORATION
122 East Second St., Mineola, L. I., N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 783

Catalogs . . .

A New Bulletin, No. 60-05.1, describes Barry Wright Corp.'s mounts for supporting high precision machine tools. The mounts support up to 30,000 lbs, and maintain absolute level within 0.00005" per ft while isolating the machine from floor-borne vibration on a column of air. Circle Inform-A-Gram No. C46.

Tetraseals, designed for direct O-ring substitution, are detailed in a new brochure published by Goshen Rubber Co. The units substitute for O-rings, size for size, from 3/16" to 15" ID. Get the bulletin by circling No. C47.



Mechanical Power transmission equipment is the subject of T. B. Wood's Sons Co.'s new Catalog 23103. It lists a range from conventional v-belt drives to split sleeve pillow blocks. Circle Inform-A-Gram No. C48.

Special Production Equipment, including resistance and arc welders, welding guns and stations, jigs and fixtures, mechanical handling equipment, automation systems and assembly presses, is the concern of a case-history bulletin published by Kirkhof Mfg. Corp. Circle Inform-A-Gram No. C49.

Direct-Current adjustable-voltage drive equipment for planers is treated in new Booklet GEA-7147 published by General Electric Co. Ask for it by circling Inform-A-Gram No. C50.

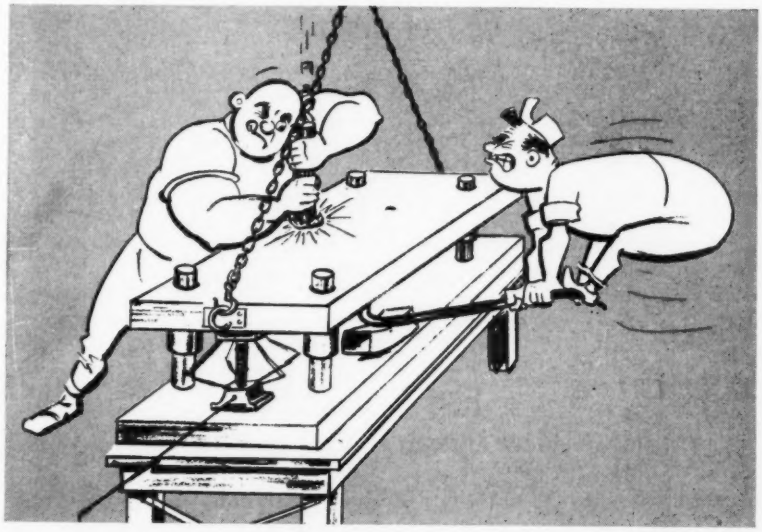
The All Steel die sets made by Wheatley Economy Die Set, Inc., are described in a new brochure. Ask for it by circling Inform-A-Gram No. C51.

End Mills, subland drills, special carbide-tipped or high speed steel tools, and the tool engineering service offered by Arrow Tool & Reamer Co. are the topic of the firm's 30-page Catalog 59. It's free if you circle C52.

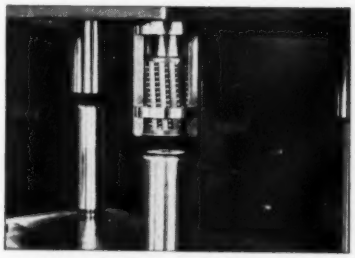
Solid Carbide Cutting Tools made by Dexco Corp.'s Raymac Div'n, are covered in the company's 1961 catalog, now ready for distribution. Circle Inform-A-Gram No. C53 for a free copy.

Chicago Straight-Side press brakes made by Dreis & Krump Mfg. Co. are the concern of the company's Bulletin SS-60. The publication clearly illustrates the large die area available on the units. Circle No. C54.

DON'T KNOCK YOURSELF OUT WITH STICKY DIE SETS!



Dieco Ball Bearing Die Sets take all the strain out of die making!



NO PAIN... NO STRAIN... and it is extremely accurate! These precision die sets give you burr-free parts and longer production runs – thanks to their "negative clearance." (Cutaway shows how ball-bearing bushing rides on the pin.)

Try a Dieco ball-bearing die set on that next job; you will actually see the punch holder g-l-i-d-e on and off. Folks tell us working with Dieco is almost like taking a two-week vacation. It's that easy.

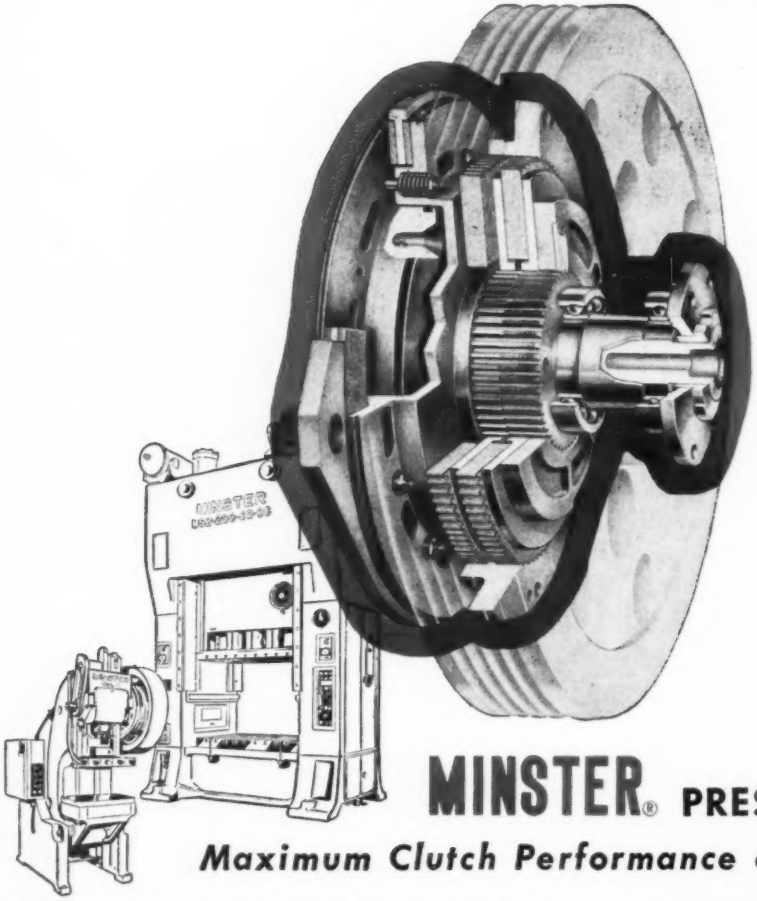
Management likes them, too. The pre-loaded bushing eliminates die shifting, protects the dies, and gives longer runs between grinds. These sets are assembled in the conventional way; pins are in the shoes. We will sell you complete sets, or just the components, so you can convert the friction bushing sets you now have.

dieco DIE SETS

E. W. BLISS COMPANY
DIE SUPPLY DIVISION
1400 Brookpark Road
Cleveland, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 79

There's a BIG DIFFERENCE in AIR FRICTION CLUTCHES



THE MINSTER CLUTCH IS MORE EFFICIENT

MINSTER® PRESS USERS *Always Get Maximum Clutch Performance and Longest Clutch Life*

It's not unusual for the clutch and brake on a Minster press **to perform, shift after shift, on rapid single cycle operation for eight, ten or twelve years without ever being disassembled for relining.**

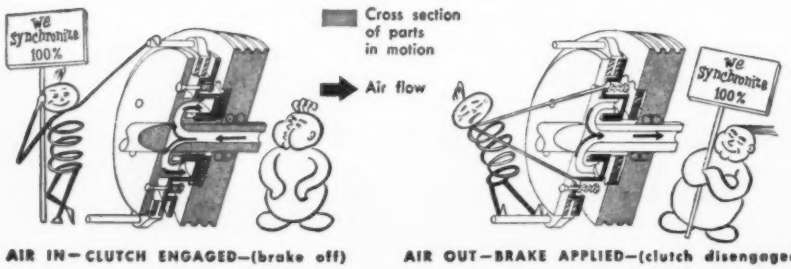
Users of all types and sizes of Minster presses consistently get that kind of service from the Minster patented Combination Air Friction Clutch and Brake.

Improvements in the design of the Minster clutch are being made continuously by Minster, **the press builder that developed and pioneered the air friction clutch for presses.** Performance records prove that, with a Minster clutch, the length of service and operational value is there.

Next time you're evaluating press equipment or considering a press clutch conversion, bear in mind, all air friction clutches are *not* alike.

THE MINSTER MACHINE COMPANY, MINSTER, OHIO

RUN **STOP**



AIR IN—CLUTCH ENGAGED—(brake off) AIR OUT—BRAKE APPLIED—(clutch disengaged)

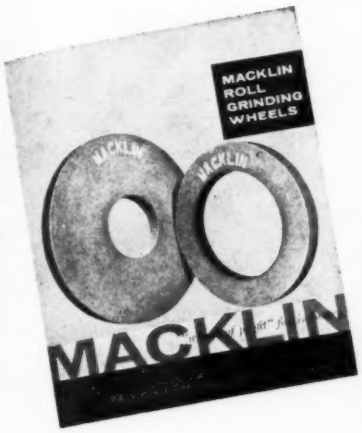
Compare the number of parts . . .

The Minster Combination Air Friction Clutch and Brake is one synchronized unit with one moving member engaging the clutch by air pressure in one direction and applying the brake in the opposite direction as air exhausts. Movement from full brake to complete engagement is the absolute minimum, assuring fast action at any speed for quick, controlled stopping.

CIRCLE INFORM-A-GRAM KEY NO. 80

Catalogs . . .

Roll Grinding Wheels manufactured by Macklin Co. are the topic of the company's latest brochure. Circle Inform-A-Gram No. C55 for a free copy.



The Current Issue of Advanced Materials Technology is a condensed resume covering the past 2½ years of new Carborundum Co. products ranging from silicon carbide materials to hot pressed alumina. The 12-page brochure is yours if you circle Inform-A-Gram No. C56.

Zinc Die Cast, one-piece gear and pinions are included in Catalog 3001-B, the latest publication from Gries Reproducer Corp. Engineering drawings and tables describe new integrally cast gear and pinion combinations. Circle Inform-A-Gram No. C57.

The Wide Range of machining operations that can be done with Acme-Gridley multiple spindle bar and chucking automatics is listed in the firm's new Catalog CA-60. It illustrates 39 bar machine, and 18 chucking machine applications. Circle Inform-A-Gram No. C58.

Information on Supfina microstoning principles and equipment is contained in 16-page Catalog 319, published by Taft-Peirce Mfg. Co. Attachments which make the process available for lathes, milling machines, grinders, planers or boring machines are described. Circle Inform-A-Gram No. C59.

The Hoppermatic, a unit that feeds, orients and counts up to 200,000 parts/hr, is described in a new bulletin from the Count-O-Matic Div'n, U.S. Engineering Co. Get it by circling C60.

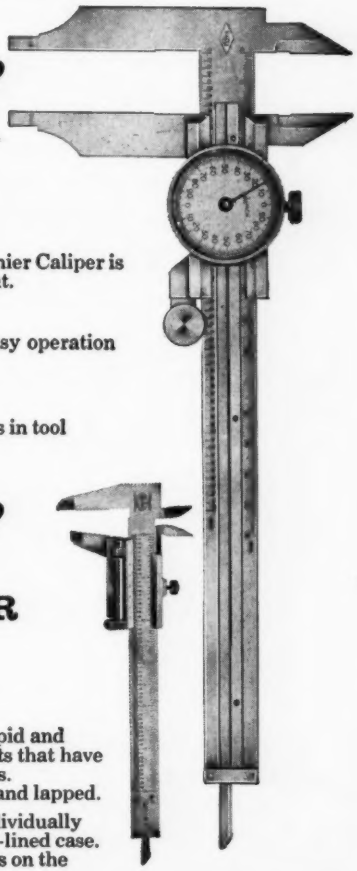
Characteristics and typical applications of Pyrotem (pre-hardened)and Pyroneal, (annealed) a hot work die steel, are given in Data Sheet 2 just published by Heppenstall Co., Pittsburgh. Company will send it if you circle Inform-A-Gram No. C61.

Cleaning and re-lubricating equipment for ball and roller bearings is the subject of a brochure released by Bearing Inspection, Inc. The described equipment will handle bearings ranging from ¼" to 14" OD. Circle C62.

A New Universal automatic thread milling machine is the subject of a Sundstrand Machine Tool brochure. The unit incorporates sine bar adjustment for threads up to ½" lead. Request it by circling Inform-A-Gram No. C63.

Eliminate costly reading errors with the

"HELIOS"
DIAL VERNIER CALIPER with built-in DIAL INDICATOR
Direct Reading in .001"



The world famous "HELIOS" Dial Vernier Caliper is hardened, ground and lapped throughout.

Other features:

- Thumb roll permits quick and easy operation
- Knurled lock screw
- 100% measuring capacity (outside, inside and depth.)

Available in 5", 6", 8" and 10" capacities in tool steel or stainless steel.

Height Gage Attachment optional.

"HELIOS"
SWING-JAW VERNIER CALIPER
with knurled lock screw

- Direct Reading
- Capacity 4¾"
- Length of Jaw 1⅝"

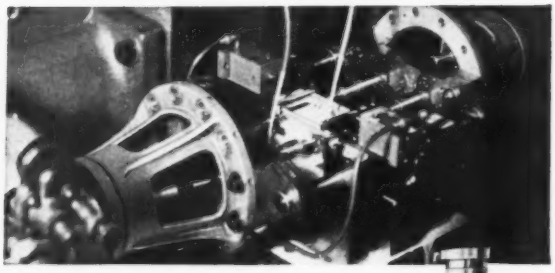
The swinging jaw allows a very easy, rapid and extremely accurate measurement of parts that have faces which do not lie along the same axis.
This caliper is stainless steel, hardened and lapped.

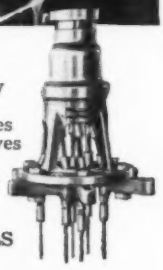
Every "HELIOS" Vernier Caliper is individually packaged in a beautiful hardwood velvet-lined case. Write for detailed information and prices on the "HELIOS" Caliper line.

U. S. REPRESENTATIVES:
M. B. I. EXPORT & IMPORT LTD.
A DIVISION OF MACHINERY BUILDERS, INC.
475 Grand Concourse, Bronx 51, N. Y.
"Over 25 years' experience in designing and building machinery."

CIRCLE INFORM-A-GRAM KEY NO. 81

PAID FOR THEMSELVES
on the first job





MULTI-DRILLS are self-liquidating adjustable multiple spindle drill press attachments for production drilling. They multiply the speed, efficiency and production of men and machines many times over. They can quickly pay for themselves —often in the first week of operation. MULTI-DRILLS are available in many models designed to drill from 2 to 15 holes (and more) at one stroke of a drill press. Thousands of MULTI-DRILLS in use today are proving that you can save time and money by multiple drilling with a Commander Adjustable MULTI-DRILL. Ask your nearby Commander Distributor to show you how a MULTI-DRILL can reduce your hole costs.

Write for the Production Tool Catalog today.

110

Commander MFG. CO.
4228 WEST KINZIE • CHICAGO 24, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 821

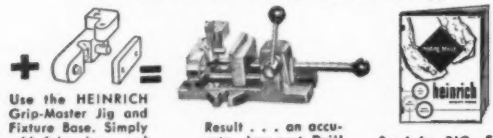
heinrich *Grip-Master*

THE ORIGINAL SCREWLESS DRILL PRESS VISE

POSITIVE LOCKING GUARANTEED

Some models have sides precision ground square with jaws for machining from 2 or 3 sides. Jaw widths 3", 4", 6" and 8" . . . from 3" to 9" openings.

CUT TOOLING COSTS UP TO 75%



Use the HEINRICH Grip-Master Jig and Fixture Base. Simply add false jaws and bushing plate.

Result . . . an accurate, low-cost Drill Jig.

Send for BIG, FREE 28-page catalog.

HEINRICH TOOLS, INC., DEPT. 130-L
Racine, Wisconsin

CIRCLE INFORM-A-GRAM KEY NO. 822

Want low-cost parts finishing?

NOW—CHOOSE FROM 7 NEW ALMCO VIBRASHEEN MACHINES

TO DO YOUR
- DEBURRING
- DESCALING
- BURNISHING
- SURFACE REFINEMENT
- CLEANING

10 to 100 Times FASTER!

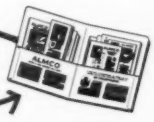
Note convenient height of controls.

IT'S A FACT! With the seven (7) new Almco Vibratory Machines, you can expect finishing time cycles 10 to 100 times faster than with standard horizontal barrel finishing equipment. It's a significant production breakthrough, made possible by creating constant vibratory motion to activate the entire mass of media and parts in the finishing container, as compared to only 20% activation with conventional barrel finishing methods.

The uniform vibratory motion of the media in recessed areas, blind holes and small I.D. dimensions make it possible to obtain optimum results on a multitude of applicable parts with intricate configurations that can not be completely processed in standard horizontal barrel machines.

Investigate today, the ALMCO *Vibra-Sheen way!*

FREE
SEND FOR ALMCO'S NEW PRODUCT ALBUM

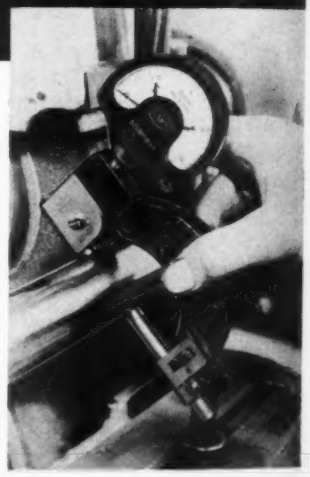


ALMCO
Queen Products Division
King-Seeley Corporation
1412 E. Main St.
Albert Lea, Minnesota

CIRCLE INFORM-A-GRAM KEY NO. 823

INDICATING SNAP GAGE

with SUPER SENSITIVE GAGING HEAD made by Mahr



ONE SNAP DOES IT
- Makes GO and NO GO gages obsolete.
- Eliminates operator "feel".
- Reads directly to 50 Millionths, 20 Millionths or ½ thousandths with interchangeable gaging heads.
- Available in 5 sizes for work from 0 to 8 inches.

Determine at a glance whether your work is within the tolerance limits. Just set the limits on the INDICATING SNAP GAGE, retract the tungsten carbide measuring faces, with one finger, and let it "SNAP." You can SEE the exact amount of material left to be removed. Ask for folder #125.

GUARANTEED Mahr QUALITY
AT YOUR FAVORITE SUPPLY HOUSE OR WRITE TO
MAHR GAGE CO.
274 Lafayette Street • New York 12, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 824

Catalogs . . .

"Crown Compressed Air Preparation Units" is the title of 20-page Bulletin 0400-B1 published by the Hannifin Co. It includes information and diagrams on filters, regulators, lubricators and matched combinations of these items. Circle Inform-A-Gram No. C64.

The Complete Line of tools made by Portage Double Quick, Inc., is illustrated in the company's new brochure. It includes quick change holders and adapters for boring, milling and drilling. The company will furnish it if you circle Inform-A-Gram No. C65.

Barrel Finishing compounds, abrasives, soaps and general media made by Tumb-L-Matic, Inc., are described in the company's Bulletin PC-60. It includes a guide to proper media selection for both wet and dry tumbling. Circle Inform-A-Gram No. C66.

"Challenges of the New Age"

This is the theme of the 65th Congress of American Industry which is being sponsored by the National Association of Manufacturers, in New York, December 7 through December 9.

Under discussion will be the challenges to be met in the fields of science, economy and education. Many notable speakers are scheduled with the keynote address to be given by the association president, Rudolph F. Bannow.

Industrial Batch Cleaning — of electric motor parts, precision gears, engine blocks, typewriter parts, etc. — is the subject of 12-page Bulletin 707-A1 from Magnus chemical Co. It's yours for circling Inform-A-Gram No. C67.

Bulletin 701 from Denison Mfg. Co. is devoted to the company's line of heavy duty and precision limit switches for machine tools. Cut-away drawings illustrate the major features of each switch. It's free if you circle C68.

The Complete Tool steel line offered by Darwin & Milner, Cleveland, is described in the firm's new 144-page catalog, which also includes a selector for their 24 varieties of tool steel. Get it by circling No. C69.

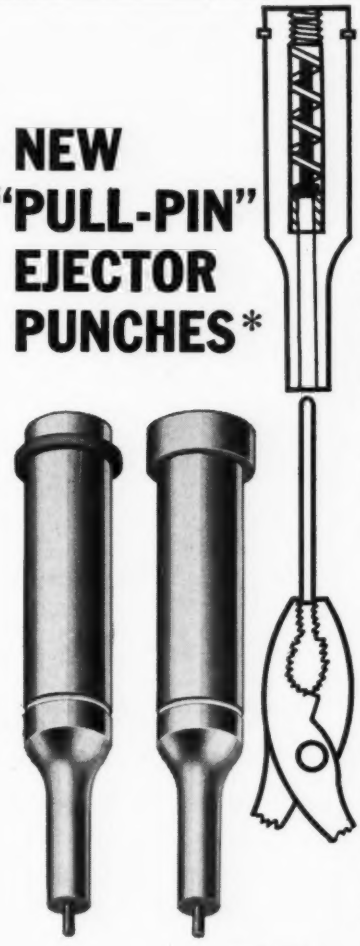
The "Roto-flo" Process of chipless machining is described in a new bulletin, RF-60, published by Michigan Tool Co. The process applies to cold-forming splines, serrations, grooves, and threads. Learn about it by circling C70.

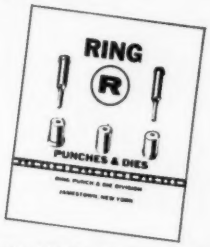
NEW "PULL-PIN" EJECTOR PUNCHES*

CUT GRINDING TIME 90%

With no special tools—*just pliers*—you can pull ejector pins from punches *in seconds!* Pull-Pin Ejector Punches eliminate the costly procedure of disassembly of punches or removal of stripper plates.

Just pull the pin, depress the stripper, sharpen the punches, push the pin back in. Even closely grouped punches are prepared for grinding instantly.





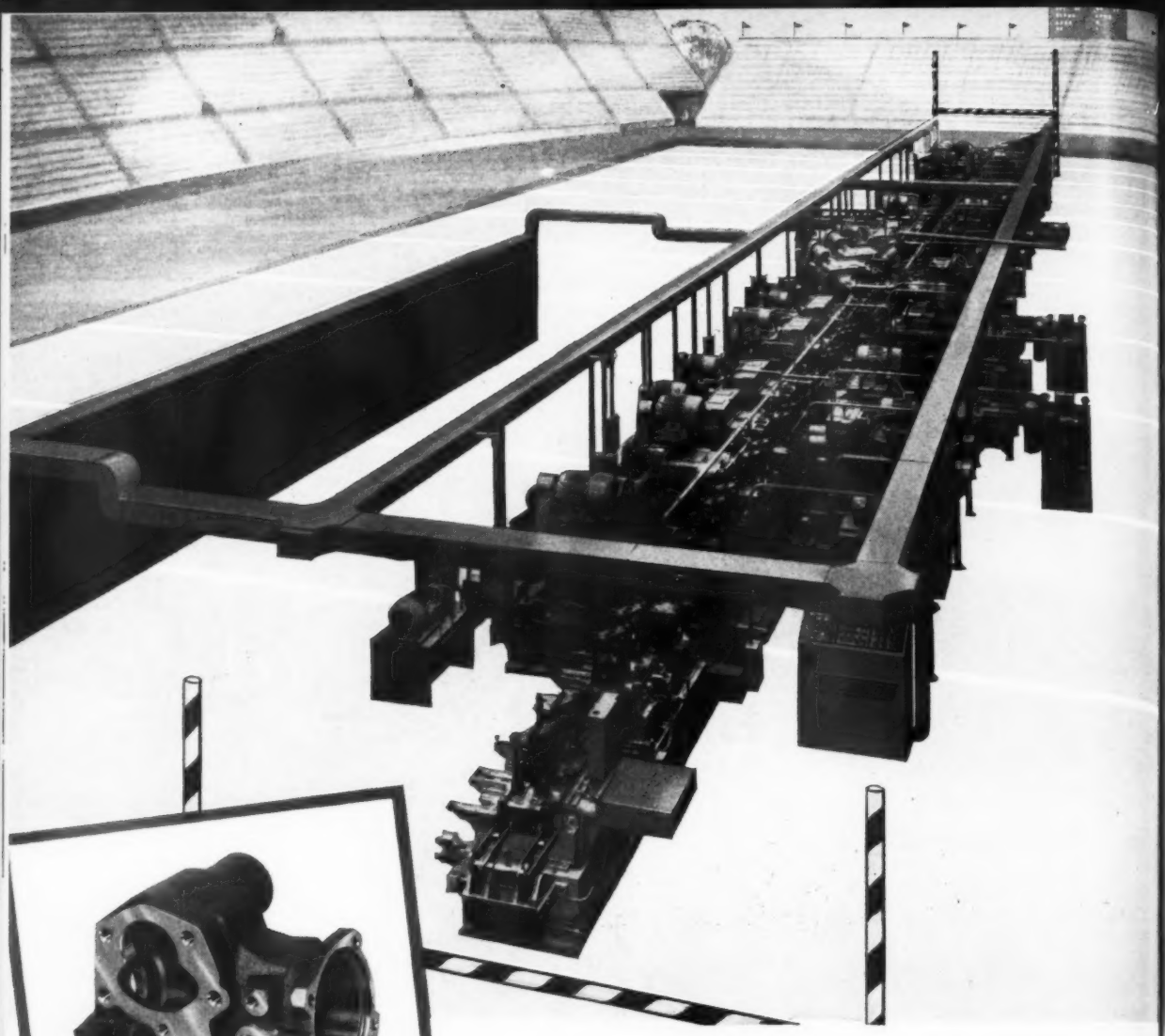
NEW CATALOG shows round and shaped punches and dies. Information is provided on engineering specifications, material and heat-treating, punch and die clearances, blanking pressures, etc. Ask your distributor, or write direct.

*PAT. PEND.

New line includes Regular, Medium and Long lengths in Ring and head-type punches; complete range of press-fit and head-type stripper bushings; quill punches in 3 sizes.

R RING PUNCH & DIE DIVISION
OF THE PRODUCTO MACHINE COMPANY
JAMESTOWN, NEW YORK
PRODUCTO

CIRCLE INFORM-A-GRAM KEY NO. 83



HYDRAULIC STEERING
GEAR HOUSING

OPERATIONS:
8 - Milling
30 - Boring
40 - Drilling
4 - Recessing
24 - Chamfering
24 - Tapping
32 - Checking

PRODUCTION MACHINERY
GREENLEE

"MACHINES DESIGNED
WITH THE FUTURE IN MIND"

300 FEET LONG . . .

completely set up and tested before shipment

Greenlee's manufacturing facilities have expanded to keep pace with customer requirements for mechanized production equipment. Complete transfer machines are production proven on our assembly floor before delivery. Test runs are made with coolant supplied from a central system built into the assembly floor. Actual production is simulated except that test run parts are subjected to 100% inspection . . . customer changes are made more readily and economically. This careful testing and thorough inspection pays off after installation . . . gets you into full production faster. Let a Greenlee representative give you the facts and figures.

TRANSFER MACHINES • SPECIAL MACHINES • SIX AND FOUR SPINDLE AUTOMATICS • DIE CASTING MACHINES
TRIM PRESSES • WOODWORKING MACHINES AND TOOLS • HYDRAULIC AND HAND TOOLS

GREENLEE BROS. & CO. 1928 MASON AVE. ROCKFORD, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 84

Ed: This looks good to me – let's discuss it – JB.

READER SERVICE CARD DEC. 1960 ISSUE

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TOOLING & PRODUCTION:
Please have information on items circled sent to me.

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COMPANY ADDRESS _____

CITY _____ ZONE _____ STATE _____

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5	17	29	66	84	612	712	871	941	982	1021	1053
6	18	30	67	85	613	741	872	942	983	1022	1071
7	19	31	68	95	621	742	873	961	984	1023	1072
8	20	32	69	109	622	743	891	962	991	1024	1073
9	21	33	73	110	623	744	892	963	992	1025	1074
10	22	34	75	541	624	781	893	964	993	1031	1075
11	23	36	76	542	625	782	894	965	994	1032	1076
12	24	49	77	543	641	783	911	971	995	1041	1081
13	25	51	79	601	642	821	912	972	1001	1042	

EDITORIAL ITEMS

C1	C13	C25	C37	C49	C61	P3	P15	P27	P39
C2	C14	C26	C38	C50	C62	P4	P16	P28	P40
C3	C15	C27	C39	C51	C63	P5	P17	P29	P41
C4	C16	C28	C40	C52	C64	P6	P18	P30	P42
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C9	C21	C33	C45	C57	C69	P11	P23	P35	
C10	C22	C34	C46	C58	C70	P12	P24	P36	
C11	C23	C35	C47	C59	P1	P13	P25	P37	
C12	C24	C36	C48	C60	P2	P14	P26	P38	

Which article in this issue was of most interest to you? _____

THESE INFORM-A-GRAM CARDS are for the convenience of TOOLING & PRODUCTION readers who, we know, rarely have stenographic help at their beck-and-call while reading. To get further information concerning selected items featured —all one needs is an INFORM-A-GRAM card and a pencil or pen to circle the number of the items wanted. If there is no identifying number, use the page number.

Our reader service department is handling over 100,000 reader inquiries per year, and it is essential that the blanks at the top of each card be filled in accurately and completely. Please use only one of these INFORM-A-GRAM cards for yourself and let one of your associates use the other.

READER SERVICE CARD DEC. 1960 ISSUE

Do Not Use This Card After Feb. 28, 1961

INFORM-A-GRAM

YOUR NAME _____ YOUR TITLE _____
(Please Print or Typewrite)

TOOLING & PRODUCTION:
Please have information on items circled sent to me.

COMPANY NAME _____

COMPANY ADDRESS _____

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EDITORIAL ITEMS

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C2	C14	C26	C38	C50	C62	P4	P16	P28	P40
C3	C15	C27	C39	C51	C63	P5	P17	P29	P41
C4	C16	C28	C40	C52	C64	P6	P18	P30	P42
C5	C17	C29	C41	C53	C65	P7	P19	P31	D1
C6	C18	C30	C42	C54	C66	P8	P20	P32	
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C12	C24	C36	C48	C60	P2	P14	P26	P38	

Which article in this issue was of most interest to you? _____

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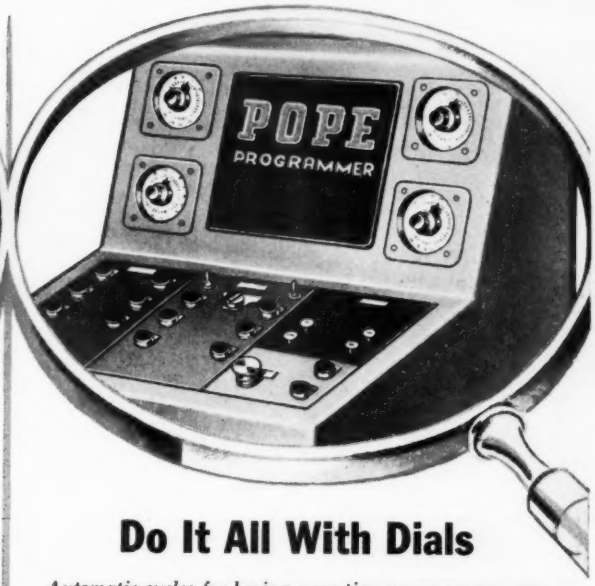
YOU CAN INCREASE PROFIT AND PRODUCTION

with this new POPE 10-6 SUPER-PRECISION BORING MACHINE



Two Heads Are Better Than One

and of course you can have more than one spindle in each head. The Pope Model 10-6 features *two precision boring heads** operating completely independently of each other to provide simultaneous or alternate cycling movement of the heads. *This means increased production.*

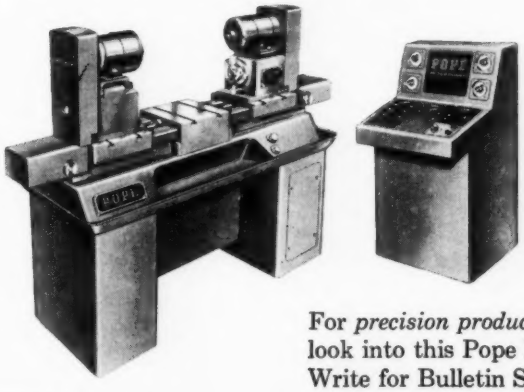
*The Pope Boring Head Spindles on this machine revolve within 20 Millionths.

Do It All With Dials

Automatic cycles for boring operation sequences are programmed on these dials. The operator simply determines the sequence of operations and dials each one. You get continuous production of uniform parts in less time.

The Pope Electric Programmer gives you finger-tip fast control of infinitely variable speed, distance and operating sequence. You dial in the complete program with ease and speed that beats expensive numerical or tape control. Constant accuracy is maintained for cycle after cycle.

- Table dimensions—12"x12"
- Maximum stroke, each head—6"
- Standard center height—5½" (variable)



No. 132

For *precision production at a profit* look into this Pope Model 10-6. Write for Bulletin S-21.

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POPE MACHINERY CORPORATION • 261 RIVER STREET • HAVERHILL, MASS.

Established 1920

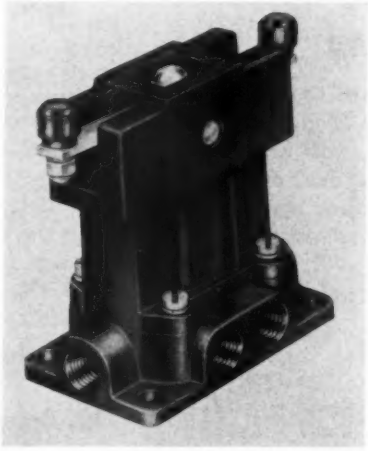
CIRCLE INFORM-A-GRAM KEY NO. 85

Product News

Coolant Filters

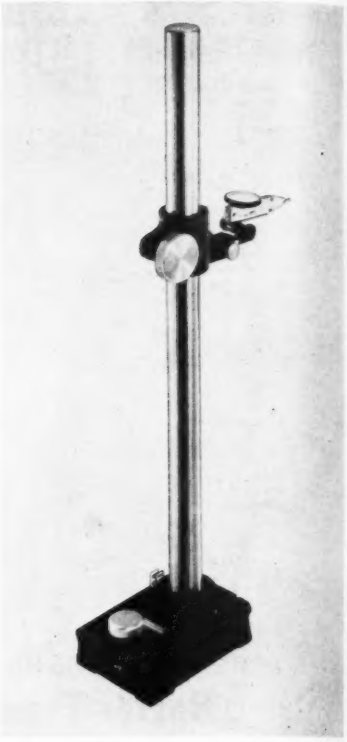
Five models of vacuum coolant filters, with capacities ranging from 150 to 1000 gpm, are in the new line made by Barnes Drill Co., 862 Chestnut St., Rockford, Ill. When dirty coolant enters the tank, heavy particles settle to the bottom to be removed by a drag conveyor. The vacuum then cleans the coolant to any degree required by the application. The company will furnish more information, or Circle Inform-A-Gram No. P1.

Directional Valve



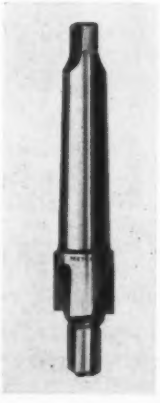
A new compact poppet type of directional valve uses a removable pipe bracket which saves space and permits easy removal of the valve for maintenance. Group mountings may also be made, without the pipe bracket, to a common manifold. The valves are suitable for 250 psi maximum air or hydraulic pressure, and a temperature range of −40°F to +160°F. Write Westinghouse Air Brake Co., Industrial Products Div'n, Wilmerding, Pa., or Circle Inform-A-Gram No. P2.

Handy Height Stand



A new general-purpose height stand, Model 2300, is offered by Federal Products Corp., Providence, R.I. It can be used with electronic gage heads and dial test indicators for measurements up to 18″. Three-point base support eliminates rocking, and is designed so that hand heat doesn't affect column support or its adjustment. Wide-range fine adjustment (up to 0.030″) is located on the base. Write the company for details, or Circle Inform-A-Gram No. P4.

Port Contour Cutters



A new line of port contour cutters has been designed by Metal Cutting Tools, Inc., to machine in one pass any of the AND, MS, NAS and SAE high pressure hydraulic fittings. The contour of the internal diameter of such fittings involves a combination of up to 4 diameters, 2 radii, 2 angles and a surface spotface. This line of cutters completes the entire contour in one pass of the tool. Write to the Company's Dept. 1067, Rockford, Ill., for details, or Circle Inform-A-Gram No. P3.

Recessing Tools

Four basic tool series comprise the Erickson line of new recessing tools: Types FR and CF automatic recessing tool holders for piloting in a jig or fixture bushing, and Types FRMP and CFMP for piloting in the work. Features include a double cam track in large diameter of shank which produces a strong tool, and minimum helix angle providing a uniform feed with low pressure. Write for details to Erickson Tool Co., 34350 Solon Rd., Solon, Ohio, or Circle Inform-A-Gram No. P5.

Direct-Air VALVES for Easy AUTOMATION

COMPLETE VALVE CATALOG Ready!

MEADMATIC

4-way pilot-operated air valve for direct or remote control—no delicate electrical hookup needed.

A light momentary touch on limit switch actuates main valve piston—response is instantaneous! Catalog free.

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Better Steel Think about Rule Dies!

Save up to 90%

ELECTROMATIC SUPER DIE SAW 42" x 52" TABLE, 50" JIG THROAT. BUILT IN FOUR SIZES 24"-30"-50"-74" THROAT
ATLAS STRAIGHT STEEL RULE CUTTING MACHINE No. 3ACS
MULTIFORM HEAVY DUTY BENDER No. 3HDC PRODUCES AN INFINITE VARIETY OF BENDS USING ONE SET OF STANDARD TOOLS
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Build steel rule dies in your own plant! Production cost and waiting time go down when Richards Equipment goes to work for you! More and more progressive manufacturers are turning to steel rule dies for faster, higher-profit work on all types and gauges of metal.

Richards' fifty years of experience as pioneer manufacturers of steel rule die-making equipment and supplies provides you with a complete service.

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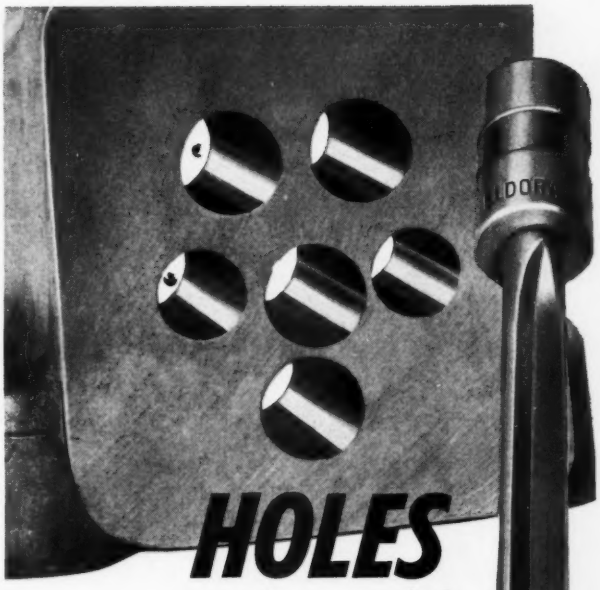

HOLES COST LESS

when drilled with ELDORADO* GUN DRILLS:

Eldorado Gun Drills are your best guarantee for excellent surface finish and top quality performance in gun drilling flawless, straight, round, accurately located holes at high speeds in **one single operation.** Each Eldorado Gun Drill is precision made to exacting specifications by gun drill specialists. Gun drill making is our business, our only business.

With hole after hole, in drilling steel, iron, aluminum or other alloys, at speeds and feeds impossible with other types of drills, Eldorado drills cut costs in time, labor, tools, materials and maintenance.

There's an Eldorado Gun Drill for your job! Immediate delivery from factory stock. We invite you to talk over your 'hole' problem, at no obligation.

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ORDER STOCK SIZES FOR IMMEDIATE SHIPMENT. TO SPECIFICATIONS, ON NORMAL DELIVERY.

MADE TO YOUR SPECIFICATIONS:		AVAILABLE FROM STOCK:	
Sizes	.1250" to 2" dia.	1/8" to 1/2" dia. in 64ths	1/2" to 3/4" dia. in 32nds
OA Lengths	4" to 120" with dia. limits	10", 16", 22", 36"	16", 22", 36"
Drivers	Std. or to fit your need	.750" dia. x 2 3/8" long	1" dia. x 2 3/4" long
Tips	Carbide	Carbide	Carbide
Now, order from stock, or send in your specifications for a prompt quotation.			

Specializing 100% in Gun Drills and Related Tools.

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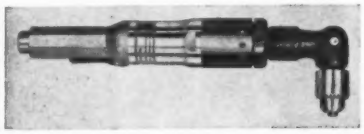
CIRCLE INFORM-A-GRAM KEY NO. 873

Product News

Drills, Drivers, Nut Setters



The air motor tools in this Series 3 line include angle drills, screw drivers and nut setters. In-line and angle attachments for the complete series are interchangeable. Tools vary from high speed, low torque, to low speed, high torque, while muffling keeps noise below the disturbing level. Drills are available with short heads or straight handles. Get more information on the line from Gardner-Denver Co., Quincy, Ill., or Circle Inform-A-Gram No. P6.

New Index Table Drive

A new open center cam index table drive for use in extremely high thrust and radial loading applications is available from Expert Automation Machine Co., 17144 Mt. Elliot Ave., Detroit 12, Mich. The drive can be used to index tables which experience high thrust and/or radial loading conditions on trunnion and dial type automated machines, stationary column machines, and special machine tools. Standard index drives of this type are offered with integral gear reducer for use on tables ranging from 20″ to 120″ dia. Company will furnish details, or Circle Inform-A-Gram No. P9.

"Fli-Kut" Improvement

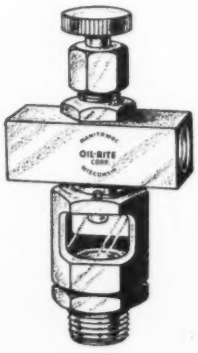
An improved model of their fly tool cutter holders that's said to give faster feeds and speeds and improved finishes, comes from City Tool-Die & Mfg. Co., Inc., 132 Spencer Ave., San Jose, Calif. A ¾″ shank size on the counterbalanced holders makes them adaptable to most vertical mills. Using 5/16″ carbide or high speed tool bits, the Fli-Kut holders reportedly allow finishes 6″ wide in one cut instead of a series of cuts as with end mills. Ask for further data from the company, or Circle Inform-A-Gram No. P7.

Miniature End Mills

Miniature end mills have been added to the cutting tool line made by Fastcut Tool Co., 25425 Mound Rd., Box 395, Warren, Mich. They're all high speed steel with hollow ground spiral flutes. Diameters range in 1/64″ increments from 3/64″ to 3/16″. Types include single-end, double-end, single end-ball and double-end ball. Ask for Catalog No. 4 from the company, or Circle P10.

Peek A-Boo Valves

These heavy-duty sight feed valves are well suited for gravity or pressure oiling systems for bearing lubrication where considerable oil capacities must be dispensed. They control volume, and indicate its flow visually in the sight chamber. Sight windows can be rotated, in relation to the inlet port of the needle valve, to the position most advantageous for the installation. Write for data to Oil-Rite Corp., 2332 Waldo Blvd., Manitowoc, Wis., or Circle Inform-A-Gram No. P8.



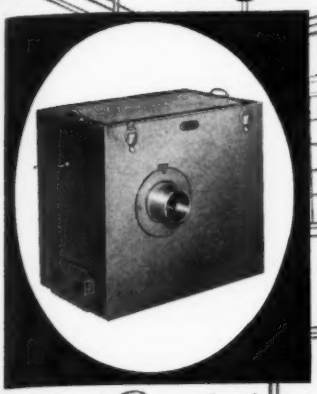
Spade Drill Line

Flat bottom spade drills from 1″ to 5″ dia are available from stock from Waukesha Cutting Tools, Inc., Dept. 14, P. O. Box 11, Waukesha, Wis. They're designed for quick insertion in the firm's standard spade drill holder. They are said to lessen blind hole machining time, can be changed without removing the drill holder from the machine, and can be furnished with corner radii to customer specifications. Write the company or Circle Inform-A-Gram No. P11.

DUSTKOP "520"

designed to collect dust from single machines

portable—easily installed



DUSTKOP STOPS DUST

Self-contained Dustkop models, like the "520," are practical and effective in collecting dust from single machines. They're designed specifically for service with surface grinders, tool and cutter grinders, offhand grinders, buffers and other small wheel equipment. These units are also easy to install — are actually portable — and very economical to operate.

Write for illustrated literature . . .
46 models to choose from!

NEW DUSTKOP AUTO SHAKER shakes filters AUTOMATICALLY

AGET manufacturing company ask for details

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★COMPACT ★POWERFUL ★RUGGED ★LOW COST

AIR-MITE Cylinders—made in Single or Double Acting Series, in 4 mounting types, are high quality cylinders at a low price. Simple, rugged design and compact construction give them long life, permit easy mounting on jigs, fixtures, tools, or machines. Used wherever power holding, pushing, pulling, or lifting is required, AIR-MITE Cylinders will meet your most exacting requirements of dependability and long life. Write for complete catalog and prices.

QUALITY FEATURES:

1. Ground and polished steel ram
2. Bronze oilless ram bushing
3. High strength aluminum alloy cylinder heads
4. Brass, true-bore cylinders
5. Five steel tie rods

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AIR-MITE DEVICES, INC.

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New Catalog Now Ready!

Send for FREE Copy!

Write for our new Catalog No. 161AF, illustrating our standard punches and dies. It also illustrates and describes our complete line of modern sheet metal fabricating equipment. Net prices are shown.

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This 84 page reference book is free to sheet metal fabricators and all users of punches and dies. Worth having handy.

WARD Machinery Co. 564 West Washington **Chicago 6**

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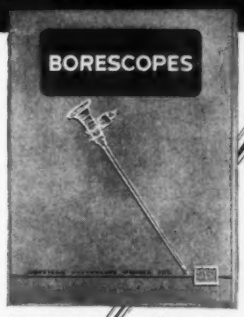

This comprehensive, elaborately illustrated booklet provides practical information on the use of the famous A. C. M. I. Borescope in various industries, for the inspection of interior areas or surfaces not otherwise visible—together with full data on the types of Borescope available, and on their care and maintenance. Have you received your copy?

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CIRCLE INFORM-A-GRAM KEY NO. 894

Product News

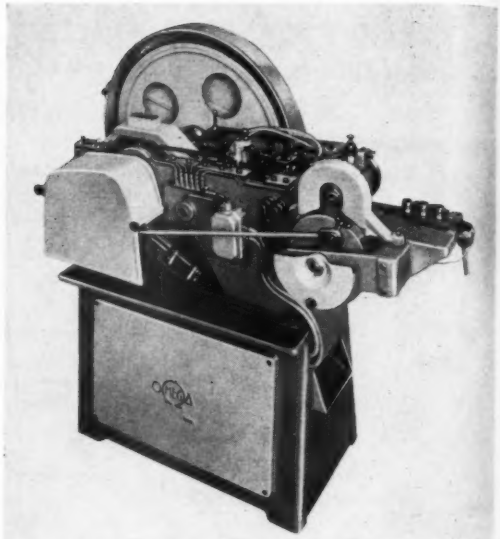
New Tool Steel

"Orbit" is the name of a new tool steel marketed by Crucible Steel Co. of America. It's a low temperature, air-hardening, free machining AISI Grade A-6 die steel that's said to combine many of the advantages of air-hardening grades with the low hardening temperature of oil-hardening grades. Write to the company, Pittsburgh 22, Pa., for more data, or Circle Inform-A-Gram No. P12.

Air Tool Attachment

A new portable router is available for use without alteration on Dotco's high-speed Model 2GL air tool. Its 3″ dia platform has an easily accessible depth adjustment. Combined with the Model 2GL's 25,000 rpm speed, it achieves its maximum production due to the higher torque of a four-van rotary air motor. Equipped with interchangeable template guides, it can accommodate standard cutters from ⅛″ to ⅜″ dia. More information is available from Doeden Tool Corp., Hicksville, Ohio, or P13.

Cold Header



A new open die cold heading machine for making long, thin parts such as lead wires, pins or rivets, is equipped with motor and vee belt drive permitting production rates of 60, 90, or 110 pcs/min. These rates are delivered on parts up to 2⅜″ long, with a nominal wire capacity of 0.020″ to 0.090″ dia. The unit has two sets of straightening rolls. Ask for details from REM Sales, Inc., Box 41, West Hartford, Conn., or Circle P15.

Power-Feeding Saw

The Model 1612-UGT band machine brings the advantages of a work feeding table to the low-cost utility saw line made by The DoAll Co., Des Plaines, Ill. It has a 16″ throat and a 12″ work height. A 24″ x 24″ work table, mounted on 8 anti-friction rollers, has 12″ of manual travel or 8″ of travel with a weight type power feed attachment. Table may be locked, permitting contour cutting. Get more information from the company, or Circle Inform-A-Gram No. P16.

Hole Finishing Tool

A new hole finisher, using an offshoot of the bearingizing process, is said to reduce 80 to 200 micro-inch surfaces to 2 to 10 micro-inches. Holes may be roughbored to tolerances up to 0.005″, then the Roll-A-Finishing tool takes over to give tolerances of ±0.0002 to ±0.0025″. When the tool enters the hole, tapered rolls ride up an inversely tapered mandrel. The metal flows ahead of the tool, filling valleys and leveling peaks. Sizes from ½″ to 2″ dia are available from Cogsdill Tool Products, Inc., 12980 W. Eight Mile Rd., Oak Park 37, Mich., or Circle P14.

New Cutting Liquid

A slow-to-evaporate cutting liquid for close tolerance machining is offered in case lots by Pacific Petrochemicals, Inc., Box 401, 5161 Triggs St., Los Angeles 22, Calif. They recommend it for close tolerance tapping, threading and form-cutting. It's said to extend tool life and improve finish quality because it contains petro-fractions and extreme pressure agents in a chemical medium. Company will furnish a free, full size aerosol can if you write them, or Circle Inform-A-Gram No. P17.

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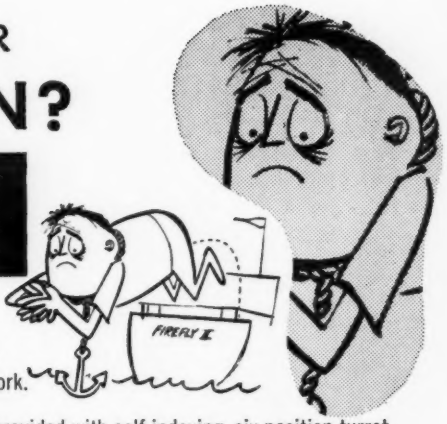
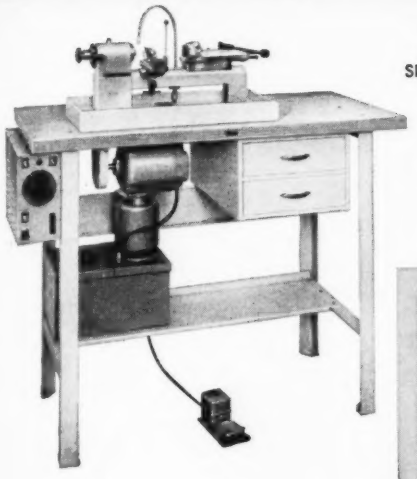
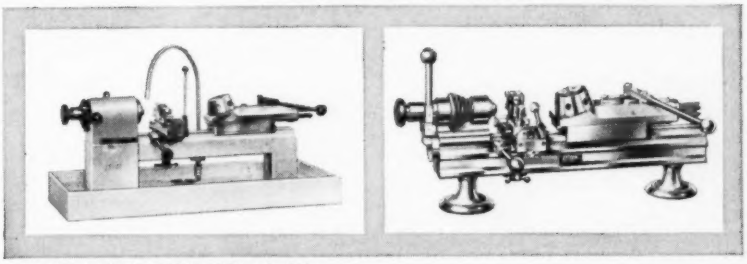




A complete Turret Lathe for small parts. Particularly useful for second operation work. Maximum collet capacity 5/16". Standard models provided with self indexing, six position turret, collet closer, double tool cross slide and variable speed control.

For full details of Turret Lathes and other Instrument Lathes send for catalog T.

Louis Levin & Son, Inc., 3573 Hayden Ave., Culver City, Calif.



CIRCLE INFORM-A-GRAM KEY NO. 911

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Manual of Machinability and Tool Evaluation

by ANTONI NIEDZWIEDZKI
Machining Consultant

TYPICAL CHAPTER COVERAGE: Tool Life Formulas . . . Tool Life Criterion . . . Chip Load and Workpiece Hardness . . . Tool Geometry . . . Test Records . . . Tool Inspection . . . Machinability Classification . . . Machine Tool Selection.

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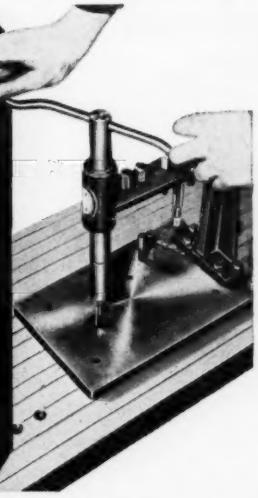
Taps By Hand with Drill Press EASE and ACCURACY



Just spot the hole and turn the handle for fast, easy custom tapping. A ruggedly built Dahlstrom Tap Guide taps straight every time—reduces tap breakage. Saves time lost digging out broken taps. Fastens to bench or carries to job . . . Taps big jobs through base . . . Spindle can tap on lathe or be a tap extension. Comes with 9 adaptors 8-32 to ¾" (taps not furnished) . . . 7½" throat . . . 8" x 11¼" table . . . wt. 32 lbs. *ORDER NOW—SAVE TAPS and TIME!*

Ask for bulletin on the Dahlstrom line of bench tools.

Branch MANUFACTURING COMPANY
16 Olson Drive, North Branch, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 912

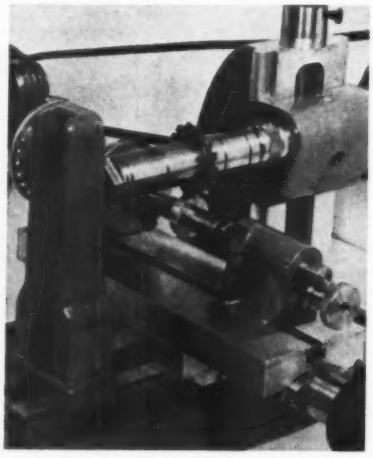
Product News

Custom Chuck Jaws

Jaws to fit any chuck or any lathe, turret lathe, miller, chucker or multi-spindle unit are offered by The Royal Machine & Tool Corp., 31 Deming Rd., Berlin, Conn. The custom design of the Grip-

Lock chuck jaws increases machining accuracy and holding power, and allows greater production. For data, write the company, or Circle Inform-A-Gram No. P18.

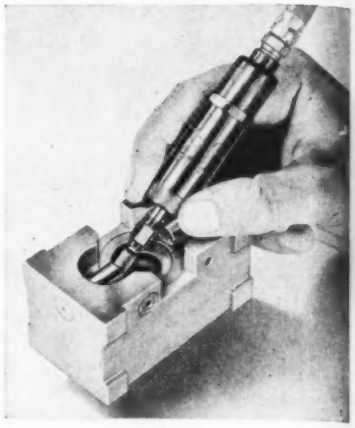
Small Milling Unit



Low cost and high accuracy are features of this new compact collet-type milling unit. It has Acme lead screws and micrometer dials calibrated in thousandths. The Micro-Hill unit drills, cuts gears, and handles small jobs which normally tie up larger machines. Write McKin Mfg. Co., 4223 Lincoln Blvd., Venice, Calif., or Circle Inform-A-Gram No. P19.

Small Grinder Improved

Bigger Bearings and larger rotor shaft are two of many construction improvements made by Buckeye Tools Corp. in their 14G-800 series Mini-Grinder. The little tool's vane-type air motor offers infinite speeds from 0 to 50,000 rpm, controlled by a ring throttle. The ⅛" and 3/32" collets have been simplified in design, and a built-in muffler refines the exhaust system. Write the company at 5003 Springboro Pike, Dayton 1, Ohio, for additional details, or Circle P20.

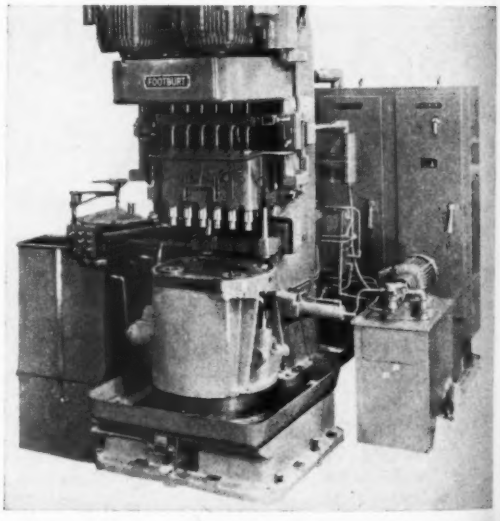


Fixture Clamp

This cadmium-plated Model 326 flipper clamp is one of four flipper clamps developed for use on fixtures where maximum clearance for stock removal is required. It can be mounted in a number of positions, including on the side of, or under, the fixture. Rivets and bushings are hardened for long life. Request details from Wespo Division, Vlier Engineering Corp., 26935 W. Seven Mile Rd., Detroit 19, Mich., or Circle Inform-A-Gram No. P21.

Vertical Gun Boring

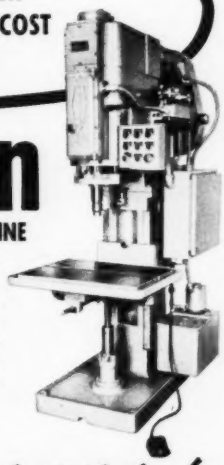
A vertical valve-seating and gun-boring machine with six spindles, built by Foote-Burt Co., Cleveland, Ohio, employs a swiveling fixture to perform a 12-spindle operation with six spindles. Each of two 3-hp motors on the head drives three quill-type double spindles. In operation, a cutter on each quill-spindle forms the valve seat and chamfers a 130° clearance angle. Then it retracts slightly, and acts as a guide bushing for the center gun-bore spindle and a tool which machines the valve guide hole for six-cylinder engine heads. Ask the company for details, or Circle Inform-A-Gram No. P22.



on any tapping job . . .
MORE PRODUCTION PER HOUR means LOWER COST for YOU with a

kaufman

MODEL 10E-20 TAPPING MACHINE



More and more manufacturers are learning this fact from hour after hour, day after day, precision production tapping on the Kaufman 10E-20. With higher production, lower product cost, increased sales in mind — you, too, should learn all about the Kaufman 10E-20.

Get the complete facts today!

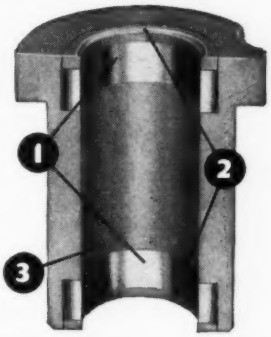
Write, wire or phone for complete information on the precision tapping machine — the Kaufman 10E-20.

kaufman MFG. CO.
PRECISION MACHINES FOR TOP PRODUCTION
529 S. 29th St., Manitowoc, Wisconsin

CIRCLE INFORM-A-GRAM KEY NO. 931

CARBIDE INSERTED MEYCO BUSHINGS Can Cut Production Costs!

MEYCO carbide inserted drill jig bushings have been successfully saving money on production runs for the past decade. Performance: same as solid carbide, but need not be handled with kid gloves. Greater economy, because of long life at less cost. You can enjoy the advantages of greater accuracy for a longer time, less spoilage, less machine down-time, added drill and jig life with MEYCO carbide inserted drill jig bushings. Get the full story now: write for new Bushing Catalog No. 41.



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1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

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BEDFORD, INDIANA
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faster changeovers boost press production

Whistler Magnetic Perforating Dies feature interchangeable parts fastened to steel templates which are patterned to the stamping. Punches and dies are assembled and disassembled in templates on an assembly bench while the presses are working on other production.

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- **EXTEND PUNCH AND DIE LIFE**
- **SAVE STORAGE SPACE**
- **ELIMINATE DELIVERY DELAYS:** Punches and dies stocked in .001″ increments from .100″ to .500″ diameters. Other sizes in stock up to 3″.

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magnetic dies • adjustable dies • custom dies

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NOW The Most Accurate-Versatile ROUNDNESS GAGE

Cleveland

INDI-RON* ultra precision Roundness, Concentricity and Squareness Gage.

★ Measures to Three Millionths Accuracy
- Roundness—any diameter, I.D. or O.D.
- Concentricity—any diameters, I.D. or O.D.
- Squareness—any surface to any axis
- Flatness—any face or flange

★ Suitable for Laboratory or Production
- Simple to operate
- Parts easily centered and tilted
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★ NO MAINTENANCE PROBLEMS
- Spindle-sealed—no maintenance
- Proven drift free gaging equipment
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MICRO-AC - Electronic Micro-Comparator

ROUGHNESS METER - For Surface finish measurement

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Ask for a demonstration and see why CLEVELAND Gages give you more.

*Patent Applied For.

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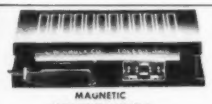
A SUBSIDIARY OF THE BENDIX CORPORATION
6220 East Schaaf Road • Cleveland 31, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 941

LW CHUCKS
Real Values in Precision and Accuracy...



MAGNETIC GRIP WORK TIGHTLY for Wet or Dry Grinding. Guaranteed waterproof. Connections for either 110 or 220v. D.C.

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5¼" x 13" $80.00
6½" x 18" $100.00
8" x 24" $213.50
10¾" x 37" $375.00

DEMAGNETIZERS
Instantly demagnetize tools or production parts. No moving parts. 110 v., 60 cy. A.C.

PLATE TYPE
MODEL B-2
7¼" x 12½" x 6½"
Ship. wt. 55 lbs. $78.00
MODEL J-1
7¼" x 7¼" x 6½"
Ship. wt. 35 lbs. $54.00

ROUND TYPE
3¾" openings
$27.50

RECTIFIERS A.C. input 110 volts; D.C. output
110 volts. P-1 for 5¼" x 13" chuck 0.8 amps. $57.50
P-2 for 6½" x 18" chuck 1.0 amps. $68.75
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DEMAGNETIZING SWITCHES For 5¼" x 13" and 6½" x 18" sizes. $15.00
Field discharge type for 8" x 24" and 10¾" x 37". $27.00

LATHE
Heavily ribbed, semi-steel cast body. Ground face and outside diameter. Solid steel hardened and ground jaws. T Hand Wrench included.

4-JAW INDEPENDENT
6" 8" 10" 12" 14"
Reversible jaws wide gripping surface. Tough, oversize hard-ened alloy steel screws with accurately cut square threads. Hardened alloy steel anchor bearings.

3-JAW UNIVERSAL
Guaranteed to run true for lathe or screw machine work. 6", 8" and 10" sizes come complete with two sets of accurately fitted jaws, male and female. 5" size has body threaded 1½" x 8", (or can be furnished for use with adapter plates) and comes with one set of 3 reversible jaws. One high grade hardened steel pinion used on 5", 6", and 8"; 3 on 10" size. Special alloy scroll.

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CIRCLE INFORM-A-GRAM KEY NO. 942

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by ANTONI NIEDZWIEDZKI
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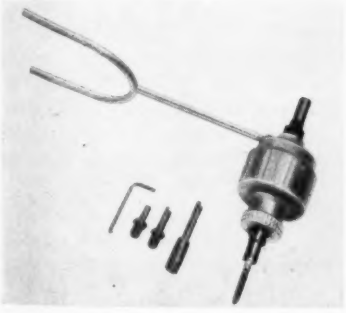
Product News

Tool Toughener

A new non-toxic steel hardening compound that carburizes, nitrides and chromizes in one operation, is called Hard-N-Tuff by maker Hard-N-Tuff Corp., Box 275, Huntington, N.Y. A single application on mild tool steels, dies and wearing parts, is said to provide a surface hardness of 60 to 65 Rc, 0.003″ to 0.006″ deep. Repeated application deepens the case. To apply, parts are simply heated red, plunged into the compound, reheated, then quenched. Get further data from the firm, or Circle Inform-A-Gram No. P23.

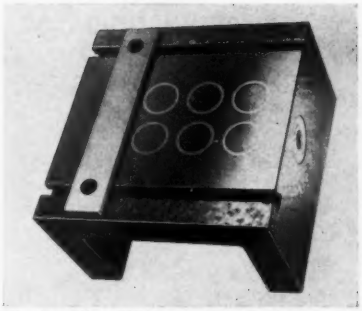
Toolmaker's Tapper



Power tapping for tool and die makers is possible with this unit that chucks in a drill press in 10 sec. A 1/2″ straight round shank fits in the drill press chuck. It can also be used with a ¼″ electric drill for driving or removing screws or nuts. Ask for details on the Babco 825 from Babcock Mfg. Co., Box 2868, Oakland 18, Calif., or Circle P24.

Magnetic Angle Plate

Inspection and layout of any ferrous metal is possible with a new magnetic angle plate that measures 6″ x 6″ x 4″. It's guaranteed to be square within 0.0002″. A removable guide rail, supported in two T-slots, can be used as a reference or support. The permanent magnetic chuck is activated by a key. Ask for more information from Bald Eagle Products Co., 60 E. 4th St., St. Paul 1, Minn., or

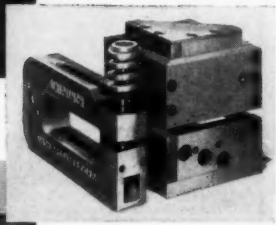


Circle No. P25 on the Inform-A-Gram card.

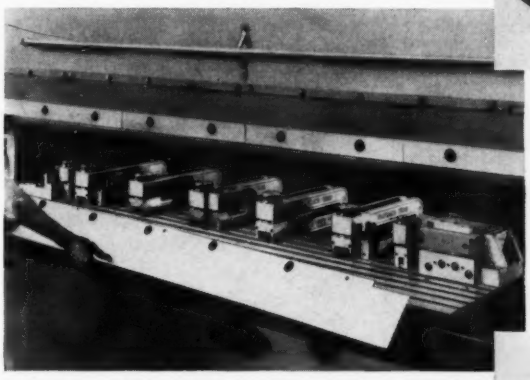
UNI PUNCH®

UNITIZED TOOLING for HOLE PUNCHING and NOTCHING

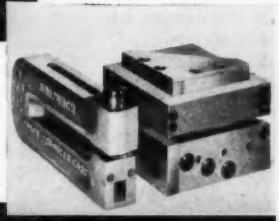
Unipunch Tooling System produces custom set-ups with standard units for punching and notching sheet metal. Set up units outside press; slide onto press bed; and produce parts with first stroke of ram—*nothing attached to press ram... no press* downtime.



● Set-up of Unipunch series "A" Hole Punching and Notching Units on a template. Series "A" Units punch and notch up to ¼″ thick mild steel.



Unipunch self-contained Units permanently align punches and dies—*no adjustments.* Units are used and reused in press and press brake set-ups—*no "dead" storage and no special capital equipment required for production of parts from sheet metal, plates, angles, channels or extrusions.*



● Set-up of Unipunch Series "B" Hole Punching and Notching Units on a T-slotted plate. Series "B" Units punch and notch up to ⅛″ thick mild steel.

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MAGNETIC BASE INDICATOR HOLDER

Model 200B—Price $6.95

¼" dia. non-magnetic stainless steel rod complete with 5/16" and ⅜" O.D. bushings. Fine precision adjustment identical to surface gage. Hardened ball socket setting permits universal positioning.
Powerful 50-lb. pull magnetic base insures firm grip on any ferrous surfaces curved or flat.

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6¾" x 6¾" Wet Cut
KELLER POWER HACKSAW
ONLY $498.00

Complete with motor and switch F.O.B. Factory

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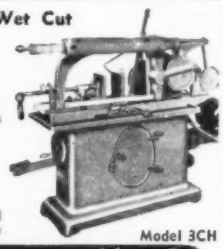
Ask your industrial Distributor or write



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Sales Service Mfg. Co.

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LIFTING DEVICES

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FAST • SAFE • BETTER
Material Handling
of
• SHEETS
• COILS • BOXES
• MOLDS
• DRUMS • PALLETS
400 MODELS

H. L. BUSHMAN CO.
100-A W. Central Ave.
Roselle, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 965

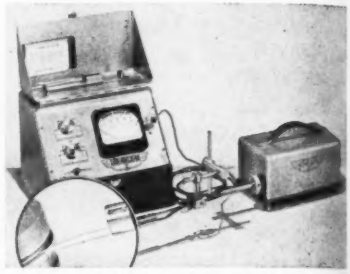
Product News

Noise No Problem

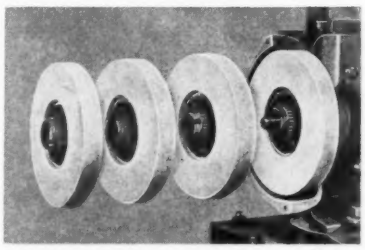
This voice gun makes you heard above the din of humming, clacking machinery. The Model A-12 power megaphone weighs just 3¼ lbs, and is a self-contained public address system consisting of microphone, transistor amplifier, speaker and power supply. Made mostly of Cyclolac, it's said to be virtually unbreakable. Write for a brochure on the voice gun to Wm. A. Holmin Corp., 1212 Eleventh St., Rockford, Ill., or Circle P26.

Surfindicator Adaptor

Measure the surface roughness of difficult-to-reach slots, bores, and grooves with this unit that adapts Brush Instruments' BL-110 Surfindicator for this otherwise inaccessible work. The Model BL-131 minimum clearance adaptor can be inserted in a slot as narrow as 0.050" and as deep as 0.085", and will measure surface irregularities within 0.010" of a shoulder. Request more data from Brush Instruments, 37th & Perkins, Cleveland 14, Ohio, or Circle Inform-A-Gram. No. P27.



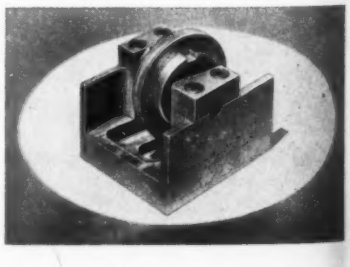
Grinder Attachment



A new taper spindle available for the R-O Grinder accepts taper wheel mounts having 3" TPF, ID bores, and speeds wheel changing. By pre-dressing all the wheels for a job, and changing them faster, multi-cut tool sharpening is simplified. Taper wheel mounts come in lengths for wheels 1/16", 1/4", 1/2" and 3/4" thick. Special wrenches are provided to remove wheels from mounts, and mounts from spindle without pounding. Get more data from R-O Mfg. Co., 31171 Stephenson Hwy., Madison Heights, Mich., or Circle Inform-A-Gram No. P28.

Diamond Dressers

Two new models of diamond wheel dressers come from L. Newman Co., 1001 24th St., Oakland 7, Calif. Model 11 is designed for the surface grinder, with or without a magnetic chuck. Model 12 is designed for Cincinnati centerless grinders. Diamond concentration comes in 1/16" and 1/8" depths, on wheels of either ¼" or ½" wide. The diamond dressers are set on a tangential angle to eliminate the need for a breaking device. Write to the company for details, or Circle Inform-A-Gram No. P29.



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TOOLING BALLS

- **Used in** jigs, fixtures and job setups as positive reference points for locating holes and surfaces at compound angles or in two or more planes.
- **Durable.** Made of hardened 440-C stainless steel.
- **Highly accurate.** Ball size is held to ±.0001″ for fixture balls; ±.00002″ for checking balls.
- **In stock** in 7 ball sizes, ¼″ to 1″ by ⅛″ steps.

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CIRCLE INFORM-A-GRAM KEY NO. 971

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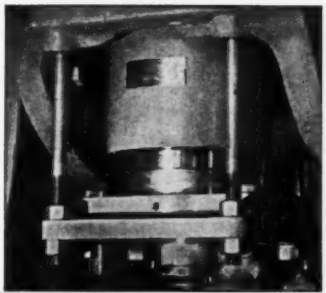
by Dayton Rogers

FOR ALL PUNCH PRESSES

to assure accurate working pressure on all dies

- Single installations from 1 ton to multiple installations of unlimited capacity, standard or designed on the job.
- Quotations on request.
- Best possible delivery.



11 Ton Full Universal Pneumatic Die Cushion Installed on Inclinable Press. →

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DAYTON ROGERS
Manufacturing Company

MINNEAPOLIS 7B, MINNESOTA

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Die Springs

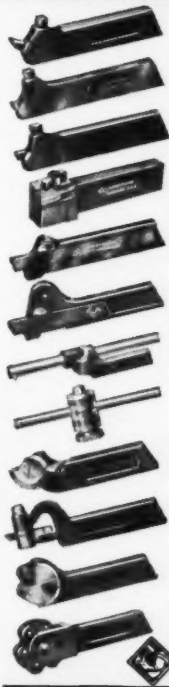
Chrome vanadium die springs in stock in a wide variety of hole and rod sizes, lengths and deflections. Medium, medium-heavy, heavy duty for increased life and reduced down time. Write for list of specifications and prices, and name of nearest distributor.

Raymond Manufacturing Division
Associated Spring Corporation
Corry, Pennsylvania

5937

CIRCLE INFORM-A-GRAM KEY NO. 973

ARMSTRONG
TOOL HOLDERS



A Correct Tool for Every Lathe Operation

You can save time (and money) by ensuring that your machine tools are equipped with *adequate numbers* of the correct ARMSTRONG Tool Holders. The ARMSTRONG System of Tool Holders includes correctly designed tools for *every* standard operation on lathes, shapers, and planers, and for many operations on turret lathes and screw machines. By utilizing the ARMSTRONG System of Tool Holders, you can reduce tooling costs, eliminate down time in tooling up, operate your machine tools at maximum feeds and speeds.

ARMSTRONG Tool Holders are long-lasting tools. They are strong beyond need, handy and efficient, profitable to use, and are readily available from your local ARMSTRONG Distributor.

Check over your ARMSTRONG Tool Holder needs. Write for literature.

If you do not know the name of your local ARMSTRONG Distributor, inquire when asking for literature.

ARMSTRONG BROS. TOOL CO. 5220 W. ARMSTRONG AVE. CHICAGO 46, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 974

DEEP HOLE DRILLING
Single or Multiple Spindle

* **STEP AND REPEAT ACTION—*NO SHOCK***
  The number of steps possible is infinitely variable—to satisfy any requirement.
* Reduces breakage and over-heating of drills.
* Can be added to existing machine, or used to replace old style units.
* Adaptable to any single or multiple—spindle application.
* Self contained—Compact

Write for Literature

* Available in from 1 to 5 H.P. —up to 12" Stroke

Typical example of a multiple spindle unit drilling in medium hard cast iron.

A Drillunit—5 H.P. Capacity will drive
10 ¼" dia. drills
or 6 ⅜" dia. drills
or 4 ½" dia. drills
or 3 ⅝" dia. drills
or 2 ¾" dia. drills
or 1 1" dia. drill

DRILLUNIT, INC.
HYDRAULIC DRILL UNITS
3267 Wight Street • Detroit 7, Michigan
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DRUM CAM

Cams and Camshafts
precision milled or ground
by the world's leading CAM manufacturer

LANDING GEAR CAM

PUMP CAM

Eonic is regularly supplying Landing Gear, Drum, Pump, Face, Cylindrical two and three dimensional Cams to manufacturers throughout the world.

Design Analysis and Engineering Services Available.

EONIC *Inc.* Engineers of Precision

Write for catalog and additional information

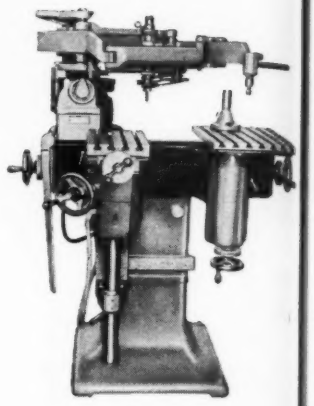
459-B E. Hollywood • Detroit 3, Michigan
CIRCLE INFORM-A-GRAM KEY NO. 982

ALEXANDER DIE-SINKERS
for 2 or 3 dimensional work

Latest model, No. 3, for molds and dies up to 1000 lbs. Ratios from 1.5:1 to 10:1, 14 spindle speeds from 475 to 9500 rpm, cutters up to ⅜" dia. Air blower removes chips.

Two smaller sizes, 1A and 2.

Prompt delivery. Spare parts are stocked in Caldwell.



Get a close look at Alexander engravers and die-sinkers—optical dividing head, centering and cutter grinder microscopes, cylinder roller attachments and other accessories. Write for catalog B.

J. ARTHUR DEAKIN, INC.
31 ROSELAND AVE. CALDWELL, N. J.
CIRCLE INFORM-A-GRAM KEY NO. 983

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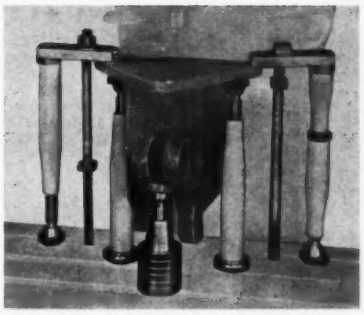
DEPT. TP-12, 712 E. 163rd ST., CLEVELAND 10, OHIO
CIRCLE INFORM-A-GRAM KEY NO. 984

Product News

Machine Tool Clamping

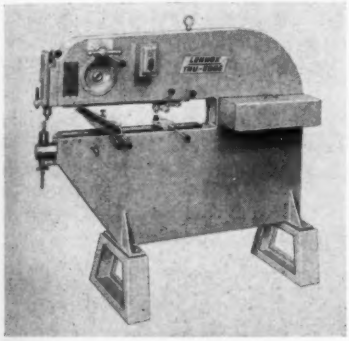
An addition to the machine tool Clamp-N-Jack setup system made by Universal Vise & Tool Co., Parma, Mich., is the Series B designed for medium sized and small machines. Components consist of swivel bases and strap clamps that are assembled together to provide an infinitely adjustable support for the clamp. Also included are spacer tubes to permit additional clamping heights when assembled



with the swivel bases. Application shown here is a typical milling machine set-up. Ask the company for details, or Circle Inform-A-Gram No. P30.

Shearing, Forming, Piercing

An intermediate size model, TE-150, which cuts in the center of 0.150″ mild steel plate without a starting hole, has been added to the Lennox line of shearing, forming and piercing machines. It has an edge-cutting capacity of 8 ga in mild steel plate; 10-11 ga in



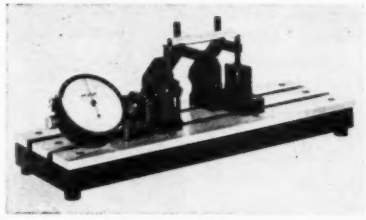
stainless steel, and 5 ga in copper. Throat depth is 42″, permitting circle cutting up to 40″ in diameter inside the throat. Request Bulletin 150 from Dept. 162, Lennox Tool & Machine Builders, Lima, Ohio, or Circle Inform-A-Gram No. P31.

Die Cushions Enlarged

Pneumatic die cushions up to 48″ dia, and with a ring holding pressure of 180 tons have been added to the power press equipment line made by Dayton Rogers Mfg. Co., Minneapolis 7, Minn. The new designs are of all steel weldment construction with bearing bronze overlay, including a centralized lubricating system. They can be provided with or without hardened and ground pin pressure pads or wear plates. Write the company for details, or Circle Inform-A-Gram No. P32.

Adjustable Length Gage

Measurement of screw machine parts such as shafts and spindles is simplified by using this adjustable length gage. Simple gage blocks, or a known size piece part can serve as a master. The bench-mounted gage is adjustable for lengths from ⅝″ to 8″, and for support on diameters from 1/16″ to 1¼″. A sensitive reed transfer carries the measurement from the part being checked to the dial in-



dicator. Further information is available from Unigage Corp., 330 Interstate Rd., Addison, Ill., or Circle Inform-A-Gram No. P33.

HARDNESS TESTING
has been done with the SCLEROSCOPE
Since 1907
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JIG BORING
and
Large Precision Machining
Done to your specifications
We Have
22 Jig Borers
KIDDE PRECISION TOOL CORPORATION
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KELLER Die Filers
Deluxe $149.50
3 MODELS
ECONOMY — 4 Way tilting table, with motor, $109.50
STANDARD—Has file roller support, with motor, $131.50
DELUXE—Has reciprocating vertical slide, with motor, $149.50

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St. Paul 14C, Minnesota
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CIRCLE INFORM-A-GRAM KEY NO. 994

MINIATURE DRILL BUSHINGS
Hole Sizes—No. 80 to 3/32″
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Lengths ¼″ to 3″
.0002 Tolerance on I.D. O.D., and Concentricity
Specials to your specifications
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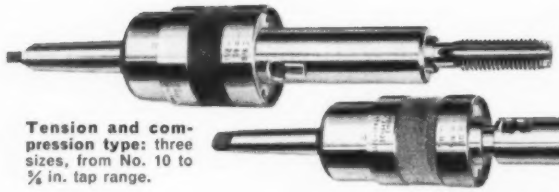
14714 East Arrow Hwy., Baldwin Park, Cal.

CIRCLE INFORM-A-GRAM KEY NO. 995



Standard type: five sizes, from No. 10 to 1½ in. tap range.

Tension and compression type: three sizes, from No. 10 to ¾ in. tap range.

overrolling tap driver eliminates breakage

Now, increase protection against hard spots, poor lubrication, blind holes . . . in fact, almost every tapping condition that reduces efficiency or increases costs.

Scully-Jones "Safe-Torque" tap driver —with unique overrolling clutch—virtually eliminates tap breakage, reduces production costs by keeping machines on the job. In operation, the driver releases instantaneously and completely well below the tap's break strength. You avoid machine downtime due to breakage, eliminate costly scrap and rework. Torque is adjustable for different tap sizes and job conditions. Once set, it remains constant no matter how often the driver releases. That's because there are no ratchet teeth, friction discs, or cones to heat up and change the torque setting. All contacting drive members roll on each other.

Your Scully-Jones representative or distributor can demonstrate the patented overrolling principle in a few minutes on your toughest tapping job. Find him in the yellow pages of your local directory, or call us direct: BIshop 7-5900.,

Scully-Jones and Company
1913 S. Rockwell St., Chicago 8, Ill. Ph. BI 7-5900

Quick-change type: three sizes from No. 10 to 1 in. tap range.

Reversible type: from No. 2 to ¼ in. tap range r.h. taps only.

SCULLY JONES **SAFE-TORQUE TAP DRIVERS**

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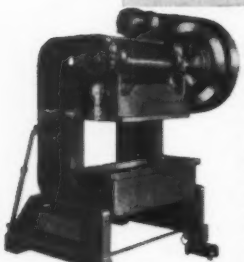
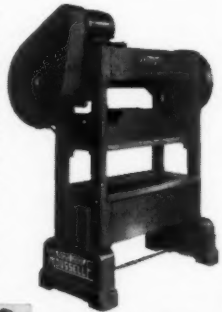
High-Output with ROUSSELLE

DOUBLE-CRANK PRESSES

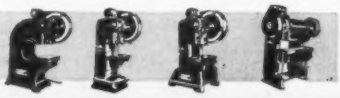


No. 48 OBI with "Econo-Air" clutch.

SPEED UP PRODUCTION with these versatile 40-ton presses. Large bed and ram areas make them ideally suited to handle wide rolls or sheets . . . do multiple punching, steel-rule die work and other high output operations. For rapid, shockless starting and stopping, presses can be equipped with electrically controlled "Econo-Air" friction clutch . . . Ask for new catalog.



Choice of over 30 models and types in 5 to 60-ton sizes



STRAIGHT SIDE —Die space up to 24 in.; bed space up to 6 ft. between uprights.

SERVICE MACHINE COMPANY
Mfrs. of Rousselle Presses
2310 WEST 78TH STREET • CHICAGO 20, ILLINOIS

Rousselle Presses are sold exclusively through Leading Machinery Dealers.

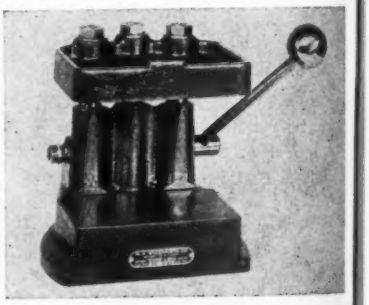
CIRCLE INFORM-A-GRAM KEY NO. 1002

Product News

Ball Comparator

The Micro-Ac ball comparator is designed to measure small lots of balls rapidly and accurately to a fraction of a millionth. Typical uses can be for checking sample lots of production runs, or the selection of matched sets of balls for diameter and random sphericity. All fixturing can be removed, if necessary, to permit gage block calibration or other comparator applications with the unit. Ask for additional information from Cleveland Instrument Co., 6220 E. Schaaf Rd., Cleveland 31, Ohio, or Circle Inform-A-Gram No. P34.

Jig Line Expanded



A new size has been added to the three-post "Cone-Lok" Jig Style #1 Series made by N. A. Woodworth Co., 1300 E. Nine Mile Rd., Detroit 26, Mich. Two models are now available in 15 sq in work area jigs, with 3″ and 5″ shut heights, respectively. They're numbered FC-1533 and FC-1535. With these additions, the firm can supply jigs from stock in work area sizes from 2 sq in. to 48 sq in. Write the company for details, or Circle Inform-A-Gram No. P35.

Product News

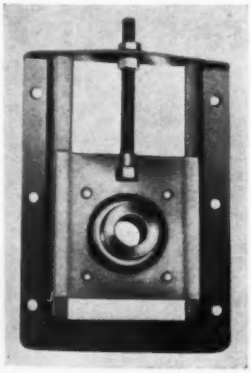
Protective Covers

Guard precision parts from dirt, chips, nicks and scratches with these Elasticone Covers made by Elasticone Div., Central Safety Equipment Co., 6610 Marsden St., Philadelphia 35, Pa. They've been applied successfully to dies, lead screws, punches, hydraulic shafts

and other working parts. The covers permit full freedom of motion from within by forming a protective cone that is self-aligning and self-adjusting through its own spring-like tension. Request more information from the company, or Circle Inform-A-Gram No. P36.

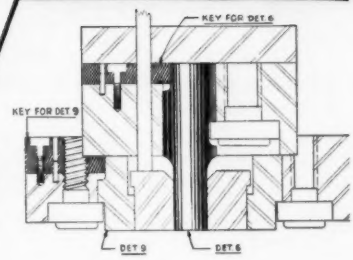
New Bearing Unit

A new light duty, economical take-up bearing unit, available either with or without frames, is now being made by Roberts Mfg. Inc., Salina, Kans. Laminated neoprene felt seals are used in the stamped bearings, sealing the grease in and the dirt and foreign matter out. For information, write the company, or Circle P37.



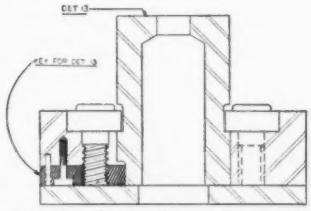
NEW
HOVIS KEY-ALIGNED DIE
THE LATEST ADDITION TO OUR STANDARD UNITS

a must for irregular stampings

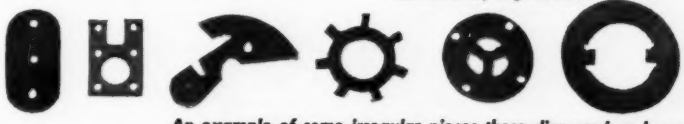


ELIMINATES ALL SET-UP ERRORS AND INSURES UNINTERRUPTED ACCURACY

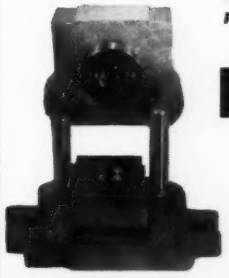
When producing irregular shaped stampings, it is important that the cutting members of the die are located in the proper radial alignment. Hovis has introduced the key-aligned die to meet this requirement . . . With the key-aligned die any press operator can install the inserts without the possibility of misalignment. This is accomplished with a flat on the insert which locates against a key in the retainer.



A section line drawing showing the principle of the Hovis key-align method.



An example of some irregular pieces these dies produce by merely purchasing special sets of parts on which we are glad to quote



Made in 6 sizes:
¾"-1½"-2½"-4"-6"-8"

HOVIS UNIVERSAL COMPOUND DIES

for producing WASHERS and SMALL STAMPINGS . . . No need to make a NEW DIE for every STAMPED PART

By simply removing and replacing five, small, interchangeable inserts a new part may be produced . . . This method makes possible all production including irregularly shaped pieces and shallow draws.

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PRECISION SHAPLANE RADIUS TOOLS

EIGHT MODELS FOR LATHES, SHAPERS, PLANERS AND BORING MILLS

Range: ⅜" to 3" for concave radii on lathes. Two sizes for convex radii (Balls up to 2½" dia.) on lathes. Also heavy duty model for radii to 6" on planers, etc.

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Patent Pending

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WHAT YOU COULDN'T DO IN

INTERNAL RECESSING

YESTERDAY...YOU CAN DO TODAY

WITH THE NEW

INTRAMATIC TOOL

only the INTRAMATIC provides these revolutionary features in AUTOMATIC internal recessing

1. Capability for wide face or multiple-form grooves.
2. Deep grooving capabilities.
3. No limitations on groove position, regardless of remoteness from entry face.
4. Back spotfacing to a maximum diameter of two times the hole diameter.
5. Pilots directly in the part for employment with any machine tool without special fixturing—or may be furnished to accommodate employment in conjunction with existing drill jigs, etc.
6. One basic Model "JA" will accommodate holes within the range of ¼"-2" (with appropriate interchangeable pilots and cutters).

MODELS FOR LARGER AND SMALLER HOLE SIZES ALSO AVAILABLE

Let us quote to your requirements involving grooves for snap rings, "O" rings, thread reliefs, undercuts, back spotfacing, etc. Submit parts print marked to show tool entry and manufacturing outline showing all applicable dimensions at time of grooving.

NOBUR MANUFACTURING CO.

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Handle TOOLS & MATERIALS

Easily with a

LIFT A LOAD

Elevating Table Top Truck

Adjustable from 24" to 42" above floor with high and low speeds for light and heavy loads up to 2000 lbs. Self locking screws prevent table backing off or dropping under load. Large hard rubber roller bearing wheels make moving easy. Improved floor lock holds truck stationary. Extra heavy four post design prevents off-center loads from tipping. Table 25" x 37", weight 270 lbs. Roller conveyor and angle set tops available, extra.

For complete details and low price write for Bulletin F-217 TODAY.

DAYTON ROGERS *Manufacturing Company*

MINNEAPOLIS 7B, MINNESOTA

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OVER 4,500,000 HOLES...

tapped with the same

TAPMATIC TAPPING ATTACHMENT!

MODEL 300A Other models available for tap sizes from #00 to 1". Reversing and Non-Reversing Spindles. Ask for TAPMATIC literature!

This Tapmatic Model 300A Tapping Attachment has tapped over 4,500,000 #10-32 holes in nickel plated steel with only $1.83 spent for maintenance! It is still in continuous operation on the same job.

Tapmatic Tapping Attachments STOP TAP BREAKAGE, make consistently perfect threads, eliminate scrap losses! Adjustable torque control; taps stop automatically when dull or loaded. Excellent for blind hole tapping!

NEW COMPACT TAPPING TOOLS—For use in multiple spindle drill heads and tight tooling quarters!

TAPMATIC CORPORATION

845 West 16th Street, Costa Mesa, California

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TRIAL SAMPLE!

SPECIAL LUBRICANT EASES WORKING STAINLESS AND TOUGH METALS

New lubricant eases stamping and machining operations on the toughest metalworking jobs—takes the problems out of hard-to-work metals such as stainless, high carbon, high chrome, cast iron, monel, etc. Scientifically developed ANCHORLUBE now used extensively in a wide range of applications—drilling, tapping, spot facing, counter-boring, milling, fly-cutting, seat forming, engraving, broaching, drawing, piercing, punching, hole extruding, etc. Application by swab, spray, roller or brush. Send today for free trial sample and see for yourself how easy you can work the job with ANCHORLUBE.

ANCHOR CHEMICAL COMPANY

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TUMBLING MEDIA *for* Deburring and Finishing

Preforms in over 300 shapes, sizes and bonds for all barrel and vibratory operations.

- **Finest bonding materials**
- **No "roll-over" of burrs**
- **Minimum media fracture**
- **Maximum production**

Free lab service reports proper media for your parts.

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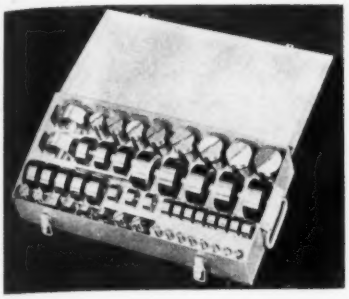
CIRCLE INFORM-A-GRAM KEY NO. 1025

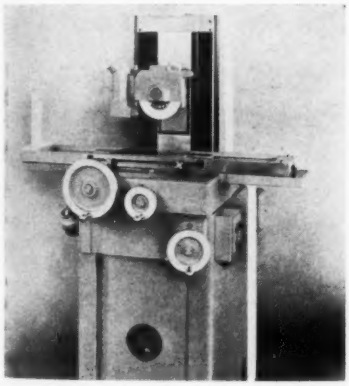
Product News

Punch Package

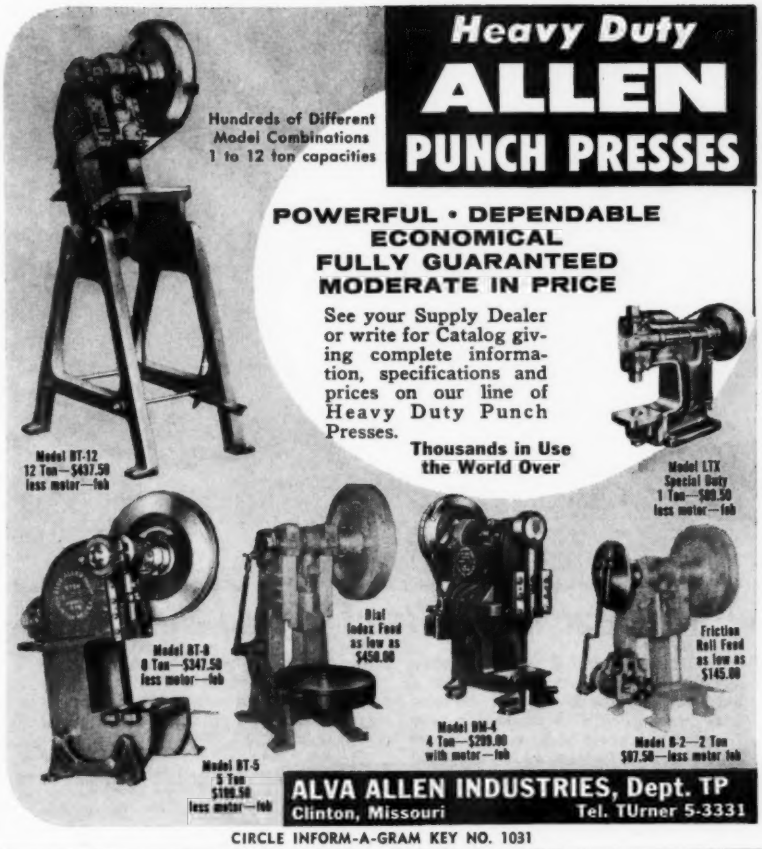


Two standard assortments of punches and dies have been packaged in specially built metal containers by O'Neil-Irwin Mfg. Co., 626 Eighth Ave., Lake City, Minn. The company says you save 10% by buying the package rather than purchasing individual units for your hand or power-operated punch presses. Thirty sizes of round punches and dies from 3/64" to 1/2", in 1/64" increments, are in Punch-Pak No. 1, while No. 2 has both round and square units. Get more details from the company, or Circle P38.

Roller-Way Grinding

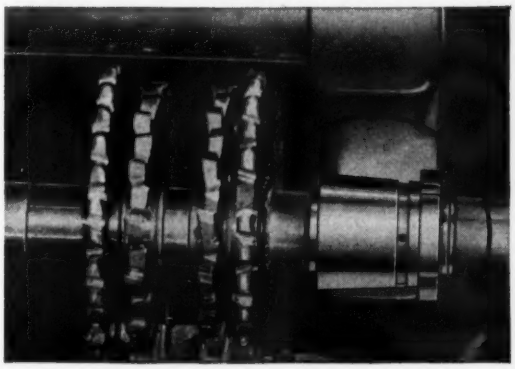


Seventy-eight precision rolls support the table and work on this hand-operated 618-HR Roller-way grinder. Non-metallic retainers separate the rolls, eliminating metal-to-metal rubbing, scratching and scoring. A table locker, for stability during wheel dressing, and a table tensioning device, to curtail free movement for special grinding, are included equipment. Reid Brothers Co., Inc., Beverly, Mass., will furnish details, or Circle Inform-A-Gram No. P39.

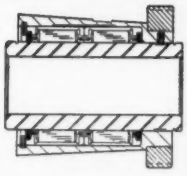

Heavy Duty
ALLEN
PUNCH PRESSES
Hundreds of Different Model Combinations 1 to 12 ton capacities
POWERFUL • DEPENDABLE
ECONOMICAL
FULLY GUARANTEED
MODERATE IN PRICE
See your Supply Dealer or write for Catalog giving complete information, specifications and prices on our line of Heavy Duty Punch Presses.
Thousands in Use the World Over
Model BT-12 12 Ton—$437.50 less motor—fob
Model LTX Special Duty 1 Ton—$89.50 less motor—fob
Model BT-8 8 Ton—$347.50 less motor—fob
Dial Index Feed as low as $450.00
Model BM-4 4 Ton—$299.00 with motor—fob
Friction Roll Feed as low as $145.00
Model BT-5 5 Ton $199.50 less motor—fob
Model B-2—2 Ton $87.50—less motor fob
ALVA ALLEN INDUSTRIES, Dept. TP
Clinton, Missouri Tel. TUrner 5-3331

CIRCLE INFORM-A-GRAM KEY NO. 1031

Replace the bronze bushing in your
MILLING MACHINE ARBOR SUPPORT
with a Sonnet ROLLER BEARING



- Faster speeds and feeds
- Maximum rigidity
- No chatter
- No bearing heating
- No bearing seizure
- No twisted arbors
- Longer cutter life
- Utilizes machine's lubrication system
- Increased Production
- Better finishes
- Less maintenance
- Faster set-ups



Installed in minutes without machine rework. Requires no extra space; no adjustments. Extra sets of bushings provided to accommodate different size arbors. Permits full range of speeds and feeds of late model milling machines. Carbide cutters can be fully utilized.

Write for catalog.

SONNET
TOOL & MFG. CO.

580 North Prairie Avenue
Hawthorne, California

CIRCLE INFORM-A-GRAM KEY NO. 1032

He's Watching a Band Sawing Miracle

This band saw operator at the Bell & Gossett Company plant in Morton Grove, Illinois, is watching "Controlled Accuracy". . . accuracy, being held to within a few thousands of being perfectly straight, and he can actually *see* the band blade being guided in the saw cut to produce this accuracy! No further machining is required before the pipe is welded into an assembly for a Bell & Gossett Heat Exchanger Unit.

Band sawing accuracy like this is nothing short of miraculous—especially when it can be done on a high production basis, as Bell & Gossett is doing. And when the same tolerances can be held on cut-off pieces from 2" to 18" in diameter, this MARVEL #81 Band Saw Machine can be truly called a precision machine tool.

The secret of this amazing sawing accuracy is in the MARVEL "SURE-LINE" Automatic Accuracy Control—a simple and extremely effective electro-mechanical servo-mechanism that continuously senses and automatically corrects any tendency of a band blade to drift to either side of a desired line of cut. The "SURE-LINE" unit literally "steers" the blade to make a straight cut. This permits the use of heavier feed pressures and, when desirable, higher blade speeds, to do the work faster, without sacrifice of accuracy. Incorporated in the new MARVEL #81 Series High Speed Heavy Duty Hydraulic Band Saws, the "SURE-LINE" permits full utilization of all the advantages of high speed steel band saw blades—while extending their usable blade life as much as 50%.

Before you buy any band saw machine, get complete details on MARVEL #81 Series Single Cut, or Automatic Shuttle Type Bar Feed Production Band Saws—the machines DESIGNED AND BUILT TO REDUCE SAWING COSTS. *Write for catalog today.*

ARMSTRONG-BLUM MANUFACTURING CO.
5700 West Bloomingdale Avenue • Chicago 39, Illinois

MARVEL *Metal Cutting* SAWS

CIRCLE INFORM-A-GRAM KEY NO. 1041

DYKEM
STEEL BLUE
DYKEM STEEL BLUE
SPECIMEN
With DYKEM Steel Blue
Without DYKEM Steel Blue
Stops Losses
making Dies and Templates
Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench, metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.
Write for sample on company letterhead
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Product News

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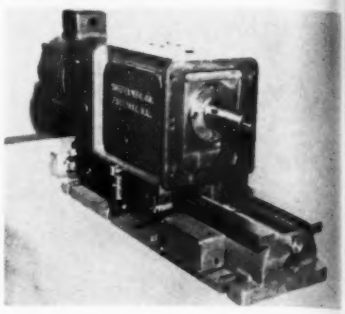

The "Pneumech" drill unit inserts readily into dial or trunnion machines, or can serve as a building block for special machines. It features a 10" maximum stroke, feed variations from 0.0016" to 0.0015" through gear changes, and speeds from 287 to 4600 rpm. It's a way-type unit that can be adapted to single or multiple spindle heads, reaming, counterboring and allied operations with maximum 2 hp capacity. Positive stops regulate depth, and provide repetitive accuracy of 0.001". Write for more data to Hoefer Mfg. Co., Freeport, Ill., or Circle P40.

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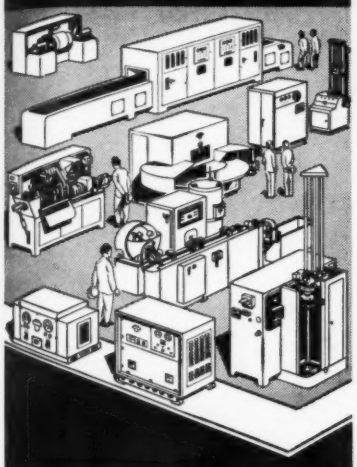

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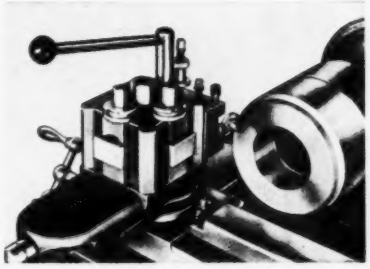

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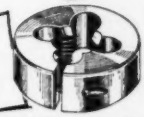

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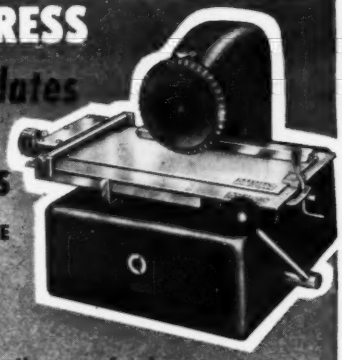

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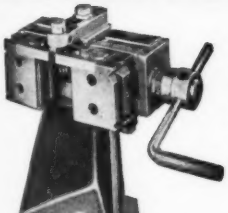

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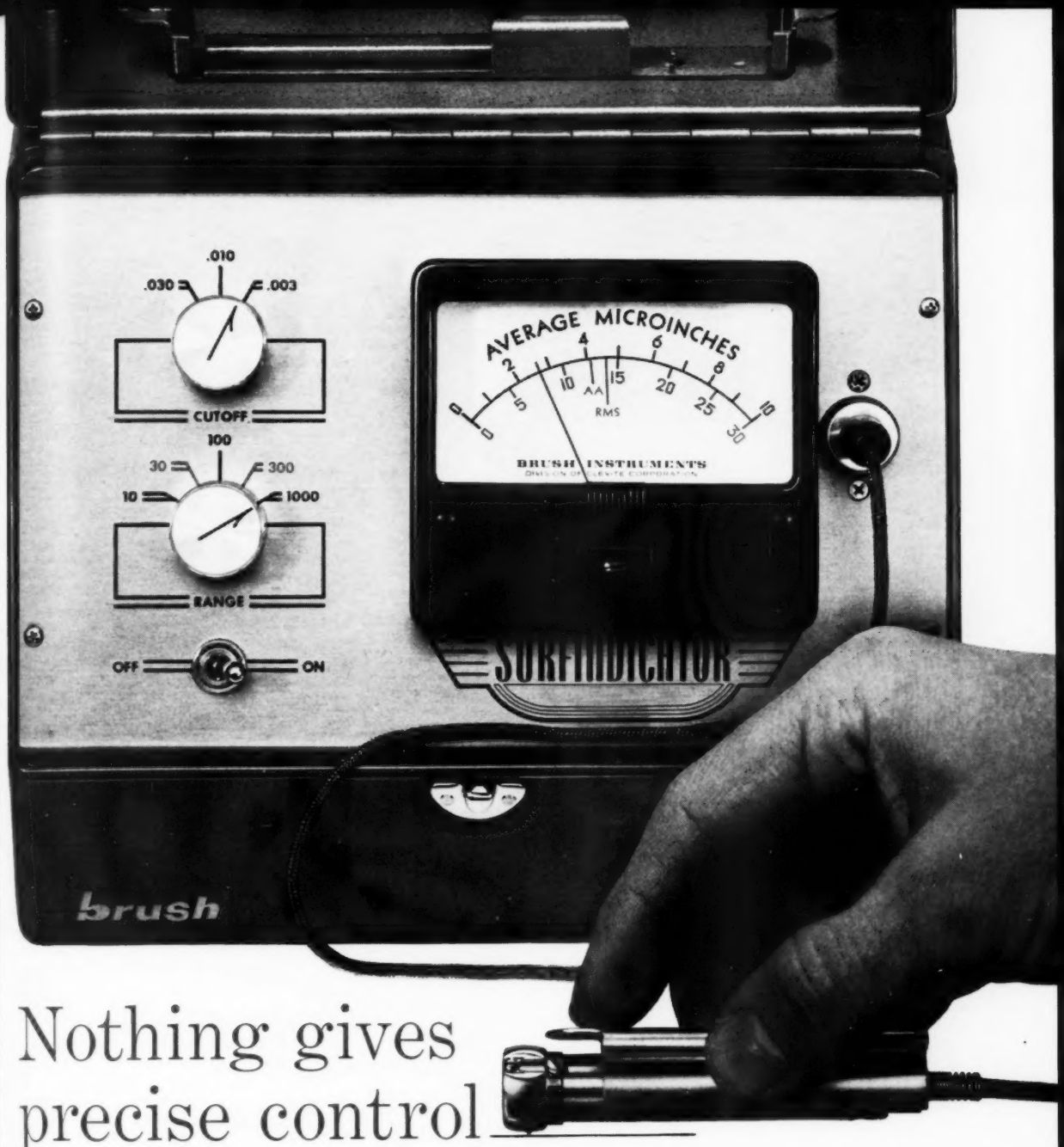

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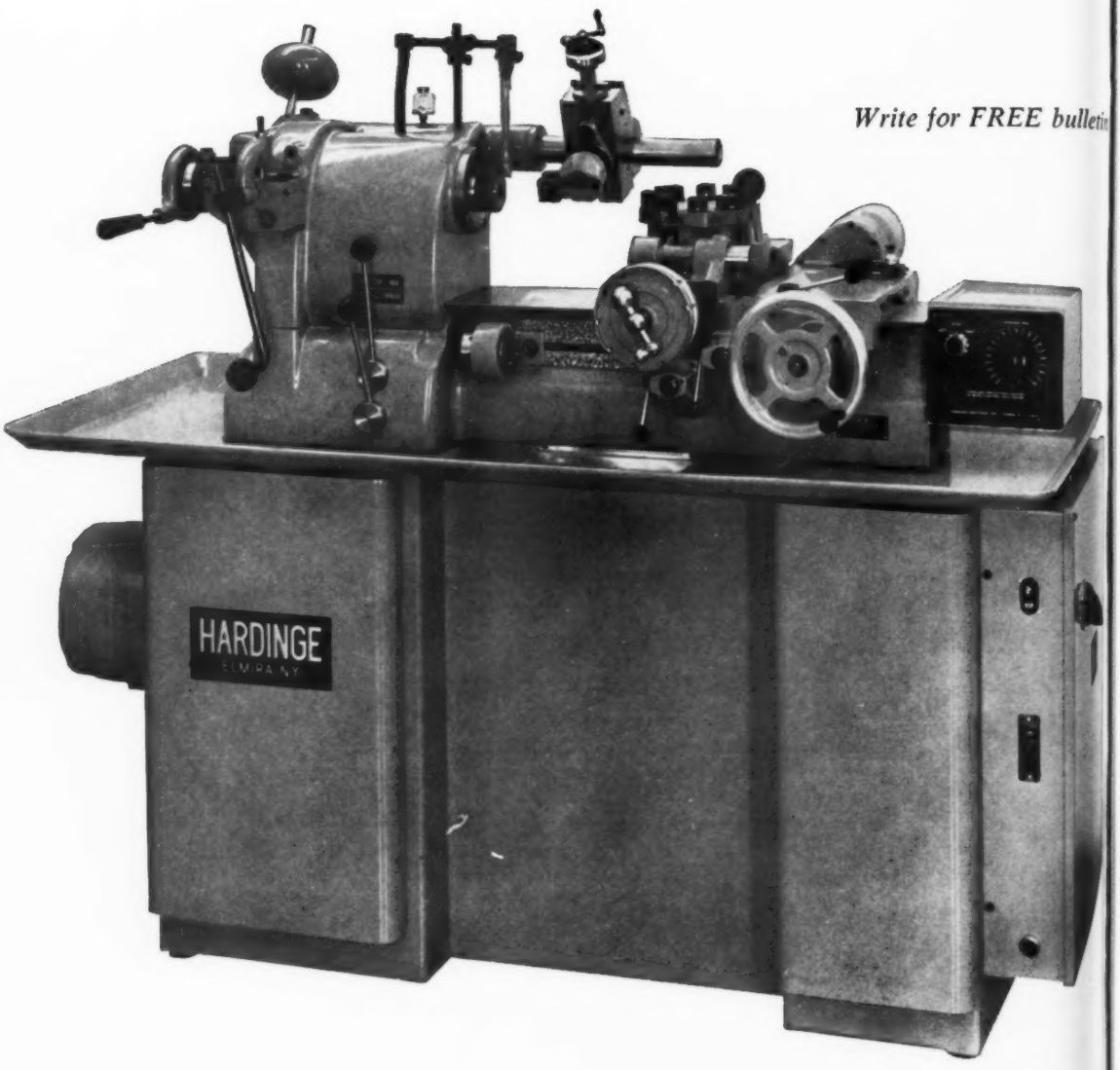

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